



Ministry of University and Research

Annex A

Programs relating to the questions in the admission tests for the master's degree courses in Medicine and Surgery (LM-41), in Dentistry and Dental Prosthetics (LM-46) and in Veterinary Medicine (LM-42) taught 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 general knowledge, with particular attention to the historical, geographical, social, and institutional contexts, and subject areas in mathematics, chemistry, physics, and biology.

The skills and knowledge required correspond to the preparation promoted by the educational institutions that organize educational and teaching activities consistent with the *national guidelines* for high schools and with the *guidelines guide* for technical institutes and vocational 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 various nature and with different communicative purposes is a transversal skill, given that all types of questions will be formulated in English, including using symbolic language.

The following skills will also be specifically tested:

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

These skills will be tested using short scientific essays or classic and contemporary fiction, or short current affairs texts published in newspapers and general or specialized magazines.

Starting from short texts of various types and themes, the skills acquired in previous studies and general knowledge of culture, including those of a supranational nature or of topics that are the subject of contemporary public debate, will be tested. In particular, the questions will aim to:
to ascertain:

- the ability to orient oneself in the space and time represented, or to place in space and significant historical-cultural phenomena over time;
- knowledge of the main national and international institutions; • understanding of phenomena relating to the legal, economic and citizenship fields.

2. Logical Reasoning and Problems The

questions are designed to test the ability to logically complete a line of reasoning, consistent with the premises. These premises are stated in symbolic or verbal form and concern cases or problems, even abstract ones, whose solution requires the adoption of various forms of logical reasoning.



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3. Biology

- The chemistry of living things.
- The biological importance of weak interactions.
- 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 prokaryotic cell and 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 cell reproduction: mitosis and meiosis - chromosome complement and maps chromosomal.
- Reproduction and heredity. Life cycles. Sexual and asexual reproduction.
- Mendelian genetics: Mendel's laws and their applications.
Classical genetics: chromosomal theory of inheritance - patterns of inheritance.
Molecular genetics: DNA structure and replication, the genetic code, protein synthesis. Prokaryotic DNA. The structure of the eukaryotic chromosome. Genes and the regulation of gene expression.

Human genetics: transmission of mono- and polyfactorial 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. Anatomy and physiology of systems and human systems and their interactions. Homeostasis.
- Bioenergetics. The energy currency of cells: ATP. Oxidation-reduction reactions in living organisms. energy processes: photosynthesis, glycolysis, aerobic respiration, and fermentation.

4. Chemistry

- The constitution of matter: the states of aggregation of matter; heterogeneous systems and 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 table of elements: groups and periods; transition elements. Periodic properties of the elements: atomic radius, ionization potential, electron affinity, metallic character.
Relationships between electronic structure, position in the periodic table, and properties of the elements.
- The chemical bond: ionic bond, covalent bond and metallic bond. Bond energy. Polarity of the bonds. Electronegativity. Intermolecular bonds.



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- 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 simple reactions, the different types of chemical reaction.
- 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 reductant.
Balancing simple reactions.
- Acids and bases: the concept of acid and base. Acidity, neutrality, and basicity of aqueous solutions. 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

- Number sets and algebra: natural, integer, rational, and real numbers. Ordering and comparison; order of magnitude and scientific notation. Operations and their properties. Proportions and percentages. Powers with integer and rational exponents and their properties. Radicals and their properties. Logarithms (base 10 and base e) and their properties. Introduction to combinatorics. Algebraic expressions, polynomials. Special products, the 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: whole and fractional algebraic, exponential, logarithmic, trigonometric.
Composite functions and inverse functions. Trigonometric equations and inequalities.
- Geometry: polygons and their properties. Circumference and circle. Length, area, and volume measurements. Isometries, similarities, and equivalences in the plane. Geometric loci. Angle measurement in degrees and radians. Sine, cosine, and tangent of an angle, and their notable values. Trigonometric formulas. Solving triangles. The Cartesian coordinate system in the plane. Distance between two points and the midpoint of a segment. Equation of a line. Conditions for parallelism and perpendicularity. Distance of a point from a line. Equation of a circumference, parabola, hyperbola, and ellipse, and their representation in the Cartesian plane. Pythagoras's theorem. Euclid's theorems (first and second).
- Probability and statistics: frequency distributions by character type and main graphical representations. Concepts of random experiment and event. Probability and frequency.



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6. Physics

- Physical quantities and their measurement: Fundamental and derived physical quantities. Systems of units of 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 vector operations.
- Kinematics: Description of motion. Velocity and angular velocity, acceleration and centripetal acceleration. Uniform rectilinear motion, uniformly accelerated motion, uniform circular motion, harmonic motion.
- Dynamics: The concept of force as an interaction between bodies. Forces as applied vectors. The law of inertia. Mass and the second law of dynamics. Examples of forces: gravitational force, spring force, static and dynamic friction. Action and reaction: the third law 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 the principles of Pascal, Stevinus, and Archimedes. Liquid dynamics: one-dimensional motion, flow and rate of flow, continuity equation. Ideal fluids and Bernoulli's equation. Viscous forces in real fluids.
- Thermodynamics: Equilibrium, concept of temperature, thermometers. Concept of heat and calorimetry. Modes of heat propagation. Heat capacity and specific heat. Changes of state and latent heats. Ideal gas laws. First and second laws 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 capacitors. Generators. Electric voltage. Electric current. Resistivity, resistance, resistors. Ohm's law. Series and parallel 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 a magnetic field. Electromagnetic induction.