Attachment A

Programs related to the admission test questions for the master's degree programs in Medicine and Surgery (LM-41), Dentistry and Dental Prosthetics (LM-46) in English language.

For admission to the courses, the following skills are required: the ability to understand and analyze written texts of various types, to conduct logical-mathematical reasoning, as well as knowledge of general culture, with a special focus on historical, geographical, social, institutional, and disciplinary aspects in mathematics, chemistry, physics, and biology.

The required skills and knowledge correspond to the preparation promoted by educational institutions that organize educational and didactic activities consistent with the National Guidelines for high schools and the Guidelines for technical and vocational institutes, especially in view of the State Examinations.

1. Reading Skills and Knowledge Acquired in Studies

The ability to comprehend written texts in the English language of different nature and with different communicative purposes constitutes a cross-cutting skill since all types of questions will be formulated in English, even using symbolic language. The following skills will also be specifically verified:

- Comprehending abstract, uncommon, or specialist vocabulary in real contexts.
- Identifying textual cohesion and coherence phenomena.
- Extracting and inferring specific information from the text.

These skills will be assessed based on short texts of scientific essays or classic and contemporary fiction, or short texts of current affairs published in newspapers and general or specialized magazines.

Starting from short texts of various types and themes, the test will also assess the competencies acquired in previous studies and knowledge of general culture, including topics of supranational scope or subjects of contemporary public debate. In particular, the questions will aim to ascertain:

- The ability to orient oneself in represented space and time, i.e., to place historically and culturally relevant phenomena in space and time.
- Knowledge of the main national and international institutions.
- Comprehension of phenomena related to legal, economic, and citizenship fields.

2. Logical Reasoning and Problem Solving

The questions are designed to assess the ability to logically complete a reasoning process coherently with the premises. These premises are stated in symbolic or verbal form and focus on cases or problems, including abstract ones, whose solution requires adopting different forms of logical reasoning.

3. Biology

- Chemistry of living organisms.
- The biological importance of weak interactions.
- Organic molecules present in organisms and their functions. The role of enzymes.

- The cell as the basis of life. Cellular theory. Cellular dimensions. Prokaryotic and eukaryotic cells, animal and plant cells. Viruses.
- The cell membrane: structure and functions; transport through the membrane. Cellular structures and their specific functions.
- Cell cycle and cell reproduction: mitosis and meiosis - chromosomal complement and chromosomal maps.
- Reproduction and heredity. Life cycles. Sexual and asexual reproduction.
- Mendelian genetics: Mendel's laws and their applications.
- Classical genetics: chromosomal theory of heredity - models of heredity. Molecular genetics: structure and duplication of DNA, genetic code, protein synthesis. DNA in prokaryotes. Structure of the eukaryotic chromosome. Genes and gene regulation.
- Human genetics: transmission of mono- and polygenic traits; autosomal and X-linked hereditary diseases.
- Mutations. Natural and artificial selection. Evolutionary theories. Genetic basis of evolution. Heredity and environment.
- Biotechnologies: recombinant DNA technology and its applications.
- Anatomy and Physiology of animals and humans. Animal tissues. Anatomy and physiology of systems and organs in humans and their interactions. Homeostasis.
- Bioenergetics. Energy currency of cells: ATP. Oxidation-reduction reactions in living organisms. Energy processes: photosynthesis, glycolysis, aerobic respiration, and fermentation.

4. Chemistry

- The composition of matter: states of matter; heterogeneous and homogeneous systems; compounds and elements.
- Ideal gas laws.
- Atomic structure: elementary particles; atomic number and mass number, isotopes, electronic structure of atoms of various elements.
- The periodic table of elements: groups and periods; transition elements. Periodic properties of elements: atomic radius, ionization potential, electron affinity, metallic character. Relationships between electronic structure, position in the periodic table, and properties of elements.
- Chemical bonding: ionic, covalent, and metallic bonding. Bond 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, concept of mole and its application, elementary stoichiometric calculations, balancing simple reactions, different types of chemical reactions.
- Solutions: solvent properties of water, solubility, major methods of expressing solution concentration.
- Equilibria in aqueous solution.
- Elements of chemical kinetics and catalysis.
- Oxidation and reduction: oxidation number, concept of oxidizing and reducing agents, balancing simple redox 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: atomic bonding in carbon atoms, molecular formulas and structural formulas, concept of isomerism. Aliphatic, alicyclic, and aromatic hydrocarbons. Functional groups: alcohols, ethers, amines, aldehydes, ketones, carboxylic acids, esters, amides. Nomenclature basics.

5. Mathematics

- Numeric sets and algebra: natural, integers, rationals, and real numbers. Ordering and comparison; orders 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. Basics of combinatorial calculus. Algebraic expressions, polynomials. Notable products, nth power of a binomial, factoring polynomials. Algebraic fractions. Algebraic equations and inequalities of the first and second degree. Systems of equations.
- Functions: fundamental concepts about functions and their graphical representations (domain, codomain, sign study, continuity, maxima, minima, growth, and decline, etc.). Elementary functions: algebraic (integer and fractional), exponential, logarithmic, trigonometric. Composite functions and inverse functions. Trigonometric equations and inequalities.
- Geometry: polygons and their properties. Circumference and circle. Measures of lengths, areas, and volumes. Isometries, similarities, and equivalences in the plane. Geometric loci. Angle measurement in degrees and radians. Sine, cosine, tangent of an angle, and their notable values. Trigonometric formulas. Solution of triangles. Cartesian coordinate system in the plane. Distance between two points and midpoint of a segment. Equation of a line. Conditions for parallelism and perpendicularity. Distance of a point from a line. Equation of the circle, parabola, hyperbola, ellipse, and their representation in the Cartesian plane. Pythagoras's theorem. Euclidean theorems (first and second).
- Probability and statistics: frequency distributions according to the type of character and main graphical representations. Concept of random experiment and event. Probability and frequency.

6. Physics

- Physical quantities and their measurement: Fundamental and derived physical quantities. Systems of measurement units: International and Technical. Multiples and submultiples. Scientific notation. Main conversions between measurement units of different systems. Scalar 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: Concept of force as interaction between bodies. Forces as applied vectors. The principle of inertia. Mass and the second law of dynamics. Examples of forces: weight, elastic force, static and dynamic friction. Action and reaction: the third law 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, Stevin, and Archimedes. Dynamics of fluids: one-dimensional motion, flow and flow rate, 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. Thermal capacity and specific heat. Phase changes 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 electric 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's effect. Direct and alternating current. Period and frequency. Magnetic field of an electric current. Forces on electric currents in a magnetic field. Electromagnetic induction.