**English TOLC-F syllabus** italyadanismanim.com

**Introduction**

The syllabi were created by a scientific committee of professors and researchers from the academic community who over time have dealt with access to the courses of study in the areas of pharmacy, chemistry and pharmaceutical technology. The Syllabi contain the knowledge required to take the entrance test.

It should be an active and conscious "knowledge" linked to practical skills and the solution of problematic situations. In particular, for all topics indicated in the syllabi it is important to have the ability to recognize and set problems, selecting the appropriate information, identifying the most suitable tools and, where necessary, schematizing and representing data and situations.

The syllabi are deliberately limited to giving essential indications, as the purpose of the entrance tests is to allow an overall assessment of the knowledge of basic subjects of the different scientific disciplines and not to measure the student's knowledge and skills analytically. If the test gives a student a negative result for a certain area, specific activities must be carried out in order to diagnose the deficiencies more precisely and identify the appropriate study strategies. These activities are necessary because, although it is true that in order to profitably follow the scientific degree courses it is not essential to know all the syllabi topics in advance, it is important that the student who does not know some (or many) of them is aware of this and can master them quickly.

The use of calculators of any kind is not permitted during the test; this does not mean that it is not important to be able to use calculation tools. In many university and work situations it may be appropriate to use pocket calculators, spreadsheets, geometric software and specific software for numerical and symbolic calculation or statistics.

It would therefore be a serious mistake for high school students to finalise all their preparation for the entrance test and limit their knowledge to the requirements contained in the syllabi.

The basis for the syllabi is the ministerial programs of these disciplines for high school students.

**BIOLOGY syllabus**

**Chemical composition of living organisms**

Bioelements. Properties of water. Molecules and macromolecules of biological interest. The structure of glucidic monomers, lipidic molecules, amino acids and nucleotides. Structure and functions of macromolecules: polysaccharides, nucleic acids and proteins. Properties of enzymes.

**Elements of biodiversity**

Diversity and levels of organization of living things. Domains and kingdoms of living things. Bacteria, Protista, Fungi, Plants, Animals. Viruses.

**Cell biology**

Cellular organization. Morpho-functional characteristics of prokaryotic and eukaryotic cells. Main cellular constituents: cell membranes, cell walls, cytoplasm, mitochondria,

plastids, ribosomes, endoplasmic reticulum, Golgi apparatus, lysosomes, nucleus, nucleolus.

**Cell cycle, reproduction, heredity**

Cell reproduction: mitosis and meiosis. Chromosome complement. Reproduction and heredity. Vital cycles. Sexual and asexual reproduction. Mendelian genetics. Classical genetics: chromosomal theory of inheritance; sexual chromosomes. Molecular genetics: DNA and genes; genetic code and its translation; protein synthesis. The DNA of prokaryotes. The chromosome of eukaryotes. Human genetics: transmission of mono- and polygenic traits; hereditary diseases. Mutation.

**Bioenergetics**

Energy flow and biological significance of photosynthesis, glycolysis, aerobic breathing and fermentation; autotrophic and heterotrophic metabolism. Ecosystem components. Trophic chains. Producers, consumers, decomposers. Interactions between species: competition, mutualism and parasitism.

**Basics of human anatomy**

Anatomy of the human body: musculoskeletal system. Systems: digestive, respiratory, circulatory, excretory, immune, endocrine, nervous, reproductive.

**Basics of physiology**

Physiology of the human body: functions of support and movement, nutrition, breathing, circulation, excretion; immune, endocrine and nervous functions, reproductive function.

**CHEMISTRY syllabus**

**The constitution of matter. The structure of the atom. The periodic system of the elements**

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 the elements: groups and periods; transition elements; periodic properties of the elements: atomic radius, ionization potential, electron affinity; metals and non-metals; relationships between electronic structures, position in the periodic system and properties. Chemical bonds: ionic and covalent bonds; polarity of bonds; electronegativity.

**The basics of general and inorganic chemistry. Inorganic compounds**

The basics of inorganic chemistry. Nomenclature and main properties of inorganic compounds: oxides, hydroxides, acids, salts; position in the periodic system.

**Chemical reactions. Oxide-reduction**

Chemical reactions and stoichiometry: atomic and molecular weight, Avogadro number, mole concept, grams to moles conversion and vice versa, simple stoichiometric calculations, balance of simple reactions, various types of chemical reactions. Oxidation and reduction: number of oxidation, notion of oxidant and reducing agent.

**Solutions. Acids and bases**

Solvent properties of water; solubility; main ways of expressing the concentration of solutions. Acids and bases: concepts of acid and base; acidity, neutrality, basicity of

aqueous solutions; pH.

**Organic chemistry**

The basics of organic chemistry: the chemistry of living things; bonds between carbon atoms; rough, structural and rational formulas; concept of isomerism; aliphatic, alicyclic and aromatic hydrocarbons; functional groups: alcohols, ethers, amines, aldehydes, ketones, carboxylic acids, esters, amides.

**MATHEMATICS syllabus**

**Numerical sets**

Numeric sets and their properties, simple operations, sorting and comparison. Absolute value. Numbers – Prime numbers, decomposition into prime factors. Greatest common divisor and least common multiple. Integer division with remainder. Ratios, proportions and percentages, powers and roots.

**Algebraic expressions**

Basic algebra. Algebraic expressions. Operations with monomials and polynomials, remarkable products, decomposition of a polynomial into factors. Division with polynomials and Ruffini's theorem.

**Equations and inequalities**

First and second degree algebraic equations and inequalities or to these referable. Absolute value, exponential and logarithmic equations and inequalities. Systems of linear and second degree equations.

**Trigonometry**

Measurements in degrees and radians. Basic trigonometric functions: sine, cosine, tangent, cotangent of an angle. Basic trigonometric relationships.

**Functions**

**Definition of function**. Domain, image and counter-image of an element. Fundamental properties of functions: monotone, limited, periodic. Function composition. Invertible functions and reverse function. Qualitative graphs of elementary functions: power functions, first and second degree polynomials, root, absolute value, exponential and logarithm, 1/x function, trigonometric functions.

**Plane geometry**

Most common plane figures and their fundamental properties. Pythagorean theorem. Properties of similar triangles. Criteria for the congruence of triangles. Perimeter and area of the main plane figures (triangles, quadrilateral, regular polygons and the circle). Incidence, parallelism and perpendicularity between straight lines in a plane.

**Solid geometry**

Lines and planes. Characteristics of main solid figures (parallelepipeds, prisms, pyramids, cylinders, cones and spheres).

**Analytical geometry**

Cartesian coordinates in the plane. Distance between two points and midpoint of a segment. The equation of a straight line. Angular coefficient. Equation of a straight line given one point and the angular coefficient. Equation of a straight line given two points.

Conditions of parallelism and perpendicularity. Straight, parallel and coincident lines. Finding the intersection point of two incident lines. Parabola with axis of symmetry parallel to the y-axis: equation, properties, coordinates of the vertex. Circumference: equation, properties, centre coordinates, and radius length.

**Combinatorial, probability and statistics**

Factorial of a number and binomial coefficient. Variation, combination and permutation. Probability of events as ratio between favourable outcomes and possible outcomes. Probability of events that are mutually exclusive, conditional, independent. Complementary events. Arithmetic mean.

**PHYSICS syllabus**

**Measures**

Formulation and quantification of phenomena with a scientific approach. Observation of everyday physical phenomena and relation to knowledge acquired. Direct and indirect measurements. Fundamental and derived magnitudes. Physical dimensions of quantities. Adimensional quantities, angles, vector quantities. Units of measurement, systems of units (CGS, International). Names and relationships between fundamental and derived units. Order of magnitude, multiples and submultiples (names and values). Conversion between units of measurement. Experimental uncertainties, measurement compatibility. Significant digits. Approximation and truncation. Scientific notation. Arithmetic mean. Relative and absolute errors. Experimental sensitivity. Precision and accuracy of measurements. Representation of the results. Laws of scale, direct and inverse proportionality.

**Kinematics and dynamics**

Vectors and operations on vectors. Kinematic quantities: displacement, velocity and acceleration (mean and instantaneous, scalar and vector). Description of motions in space (trajectory) and time (hourly equation). Various motions, in particular uniform linear motion, uniformly accelerated motion and uniform circular motion. [For all types of motion: definition and relationships between related kinematic quantities, graphic representation]. Concept of frequency and period.

**Forces**

Concept of mass. Concept of force. The three laws of dynamics. Vector composition of forces, resultant. Law of universal gravitation and acceleration of gravity. Concept of weight. Other examples of forces: friction, elastic and electric forces. Vector composition of forces, resultant. Work. Kinetic energy. Conservative force and potential energy. Law of conservation of mechanical energy. Concept of momentum.

**Fluid mechanics**

States of aggregation of matter. Fluids. Density. Pressure and its units of measurement (not only the SI system). Stevin's law. Pascal's principle. Hydrostatic thrust (Principle of Archimedes). Flow. Energy conservation for moving fluids.

**Thermology, gas kinetic theory, thermodynamics**

Temperature, thermal equilibrium (zero principle). Thermometric scales. Gases and

perfect gases. Mole, Avogadro number, atomic mass. Internal energy of monatomic gases. Heat. Specific heat and heat capacity. Changes of state and latent heat. Gas kinetic theory. Equation of state, gas laws and perfect gas state equation. Isochoric, isobaric, isothermal and adiabatic processes. First, second and third principles of thermodynamics. Definition of entropy. State function. Thermal expansion. Mechanisms of heat transfer: conduction, convection, radiation. Joule effect.

**Electrostatics, electric currents, magnetism**

Electric charge, induction. Coulomb's law. The electric field. Direct current. Electrical potential, electrical resistance, resistivity, Ohm's law. Magnetic phenomena. Magnetic dipole. Magnetic field. A magnetic field due to a wire of infinite length carrying a current. Lorentz force. Faraday-Lenz law and induced currents.

**Wave phenomena. Geometric optics**

General specifications of waves, Wavelength. Wave propagation (qualitative) Velocity. Types of waves. Interference and diffraction phenomena. Sound waves. Notions on electromagnetic waves and the nature of light. Light spectrum, dispersion. Reflection, refraction. Total reflection. Optical Path. Mirrors Dioptres. Thin lens. Optics focus. Images. Magnification.

**LOGIC Syllabus**

**Logic and language**

Logic of propositions. Necessary and sufficient conditions. Interpretation of various types of graphic representations and tables. Consideration on elementary mathematical concepts.