

SYLLABI FOR THE NEW TEST

March 2026

English version

Scientific Thinking

1. Mathematical Thinking

- Interpret graphs given an example
- Predict changes in variables in simple formulae
- Use formulae by substituting values and calculating the result
- Solve problems with symbols in place of variables, including simultaneous equations
- Put numbers in the correct order, including decimals and negative numbers
- Work with orders of magnitudes and conversions

2. Procedural Thinking

- Follow a procedure/protocol/algorithm correctly (for example by using a flow chart)
- Predict the outcome of a perturbation in an interconnected system
- Apply the concept of collecting elements from different sets
- Compare a set of data with a scientific theory that can be confirmed or disproved by data
- Select relevant data
- Choose the most effective concept map to summarise a text

3. Visual Thinking

- Demonstrate three-dimensional thinking ability
- Find complementary shapes
- Recognise mirror images
- Identify different visual patterns, including based on a description or an example
- Demonstrate careful observations, including localising objects in relation to other objects
- Describe a picture or a set of elements

Academic Literacy

Characteristics of the texts:

- **CEFR level:** C1 and above (text and items)
- **Sources:** adapted from real-world sources, about scientific topics
- **Text length:** approximately 700 words

Abilities tested:

- **Critical Thinking**, e.g. drawing reasoned conclusions and implications from data, statements, principles, judgements, beliefs or opinions.
- **Local expeditious reading**, e.g. scanning and searching for specific details.
- **Global expeditious reading**, e.g. skimming for gist, searching for key ideas.
- **Global careful reading**, e.g. comprehending main ideas, connecting ideas from different paragraphs and understanding how different paragraphs relate to each other.
- **Word- and sentence-level processes**, e.g. word recognition, meaning of a preposition.

Biology

1. The chemistry of living things:

- the biological importance of weak interactions
- organic molecules in organisms and their respective functions
- the role of enzymes

2. The cell as the basis of life:

- cell theory and cell size, prokaryotic and eukaryotic cells, animal and plant cells
- viruses
- The structure and function of the cell membrane and transport across the membrane
- Cellular structures and their specific functions
- Cell cycle and cell division: mitosis and meiosis
- Chromosomes and chromosome maps

3. Bioenergetics:

- ATP as the energy currency of cells
- Redox reactions in living things
- Photosynthesis
- Glycolysis
- Aerobic respiration
- Fermentation

4. 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 replication of DNA, the genetic code, protein synthesis.
- Prokaryotic DNA
- Eukaryotic chromosome structure
- Genes and regulation of gene expression
- Human genetics: mono- and multifactorial character transmission; hereditary diseases - autosomal and linked to chromosome X

5. Inheritance and environment - Anatomy and physiology of animals and humans:

- Mutations, Natural and artificial selection
- Evolutionary theories, the genetic basis of evolution
- The animal tissues
- Anatomy and physiology of systems in humans and their interactions
- Homeostasis

Chemistry

1. Structure of Matter and Periodic Table

- Atoms, molecules, isotopes, elements, and compounds.
- Atomic number, mass number, quantum numbers, and electronic configuration (Pauli exclusion principle, Hund's rule, Aufbau principle).
- Periodic table: groups, periods, metals/non-metals/metalloids, periodic properties (atomic/ionic radius, ionization energy, electron affinity).
- States of matter, heterogeneous and homogeneous systems.
- Ideal gases and Boyle's, Charles's, Avogadro's, and Dalton's laws.

2. Chemical Bonding and Properties of Matter

- Ionic, covalent, and metallic bonds.
- Electronegativity and bond polarity.
- Basic molecular geometry: VSEPR theory.
- Introduction to hybridization (sp , sp^2 , sp^3) to understand the geometry of simple molecules.
- Intermolecular forces: dipole-dipole, London dispersion forces, hydrogen bonding.
- Ionic, metallic, covalent, and molecular solids.

3. Stoichiometry and Chemical Reactions

- Atomic and molecular mass, Avogadro's number, mole, molar mass, empirical and molecular formula.
- Types of chemical reactions: synthesis, decomposition, substitution, combustion, acid-base.
- Chemical equations and their balancing.
- Reactions in aqueous solution and basic stoichiometric calculations, including concentration calculations.

4. Equilibria, Acids-Bases, and Redox Reactions

- Concept of chemical equilibrium.
- Acids and bases according to Arrhenius and Brønsted-Lowry.
- Concept of pH, neutralization, hydrolysis, and buffer solutions.
- Oxidation number, oxidizing and reducing agents.
- Balancing of simple redox reactions.

5. Fundamentals of Organic Chemistry

- C–C bonds, structural formulas, and concept of isomerism.
- Classification and nomenclature of hydrocarbons (alkanes, alkenes, alkynes, aromatics).
- Main functional groups: alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines, and amides.
- General properties of the main classes of organic compounds and simple characteristic reactions (e.g., combustion, alcohol oxidation).

Mathematics

1. Algebra and Number Sets:

- Number sets: natural, integer, rational, real.
- Operations and their properties; absolute value; proportions and percentages.
- Powers with integer and rational exponents, roots, logarithms (base 10 and e) and their properties.
- Algebraic expressions, special products, expansion of binomial powers, factorization of polynomials.
- Algebraic fractions.
- First- and second-degree equations and inequalities (including rational ones), simple systems of linear equations.

2. Functions:

- Concept of a function, domain and codomain, sign, monotonicity, maxima/minima.
- Polynomial and rational functions, exponential, logarithmic, and trigonometric functions.
- Composition and inverse of a function.
- Basic exponential, logarithmic, and trigonometric equations and inequalities.
- Graphical representation of functions and recognition of simple symmetries.

3. Geometry and Trigonometry:

- Polygons, circumference, areas, perimeters, surface areas and volumes of simple solids.
- Isometries, similarities, equivalences.
- Measurement of angles in degrees and radians.
- Sine, cosine, tangent functions and notable values.
- Main trigonometric formulas (sum, difference, double angle) and solving triangles.
- Analytic geometry: distance between two points, midpoint of a segment, equation of a straight line, conditions for parallelism and perpendicularity, distance from a point to a line.
- Equation of the circle and parabola (basic notions of ellipse and hyperbola without full treatment).

4. Logic and Mathematical Reasoning:

- Basics of propositional calculus: propositions, logical connectives, truth tables.
- Basics of predicate calculus: predicates, quantifiers, and their laws.
- Evaluation of logical expressions.
- Rules of inference.
- Proof by contradiction.

5. Probability, Statistics, and Combinatorics:

- Random experiments, events, frequency, and probability.
- Frequency distributions, graphical representations (histograms, bar and pie charts).
- Mean, mode, median; basics of variance and standard deviation.
- Basic counting techniques: simple permutations and combinations.

Physics

1. Measures and Kinematics:

- Direct and indirect measures, fundamental and derived quantities, physical dimensions of quantities, scalars and vectors.
- The CGS System of Units and the International System (SI) of units of measurement, nomenclature of multiples and submultiples.
- Position, displacement, velocity, acceleration.
- Uniform rectilinear and circular motion.
- Uniformly accelerating rectilinear motion.
- Harmonic motion.

2. Dynamics:

- Forces and moments.
- Mass, gravitational acceleration, weight, Newton's law of universal gravitation.
- The 1st, 2nd and 3rd law of motion.
- Work, kinetic energy, potential energy, and the principle of conservation of energy; friction.
- Impulse, momentum, and the principle of conservation of momentum.
- Angular momentum and conservation of angular momentum.

3. Fluid mechanics and Optics:

- Density, pressure, and their units of measurement (SI and non-SI).
- Pascal's principle and Archimedes' principle.
- Stevino's law and the Bernoulli equation.
- Fermat principle.
- Reflection, refraction and Snell's law.
- Prisms, mirrors and lenses, interference, diffraction.

4. Thermodynamics:

- Thermometry and calorimetry, thermal capacity and specific heat capacity.
- Modes of heat propagation, changes of state and latent heats.
- Ideal gas laws.
- First and second laws of thermodynamics.
- Entropy.
- Thermodynamic cycles, efficiency of a thermal machine.

5. Electrostatics and Electrodynamics:

- Coulomb's law, electric field, Gauss's law, and potential.
- Capacitors and electrical resistances (in series and in parallel), direct current, Ohm's laws, Kirchhoff's principles.
- Electric generators, work, power, Joule effect.
- Magnetic field, the Lorentz force, the Ampère's law.
- Electromagnetic induction and alternating currents.
- Electromagnetic waves: wavelength, frequency, energy.