Entrance Examination Topics

I. Biology

1. Cell Biology

- Types and function of lipids
- Biologically important carbohydrates
- Primary, secondary, tertiary and quaternary protein structure
- The structure of DNA and RNA
- Types and function of RNA molecules
- What are the enzymes and how are enzymes regulated?
- Glycolysis
- The citric acid cycle
- Mechanism of ATP production in the mitochondria
- Replication
- Transcription
- Translation
- The nucleus
- Chromosomes
- Endoplasmic reticulum
- The Golgi apparatus
- Ribosomes
- Cytoskeleton
- Exocytosis, endocytosis
- The cell membrane
- Mitosis
- Meiosis
- Structure of the bacterial cells
- Transformation, conjugation and transduction
- Structure of the viruses

2. Physiology

- Parts of the digestive system
- Digestive enzymes, absorption of food and water
- Parts of the respiratory system, mechanism of inhalation and exhalation
- Oxygen and carbon dioxide exchange in the lungs
- Parts of the excretory system
- Water and ion transport in the kidneys
- Parts of the circulatory system
- Structure and function of the heart
- Blood, composition, cell types
- The cellular immune response

- The humoral immune response
- Muscles, bones, joints
- Muscle contraction
- Parts of the male reproductive system
- Parts of the female reproductive system
- The ovarian cycle and the uterine cycle
- Hormonal control of the reproductive system
- The pituitary gland and it's hormones
- The adrenal gland and it's hormones
- The thyroid gland and it's hormones
- The pancreas and it's hormones
- The autonomic nervous system
- The spinal cord, spinal reflexes
- Parts of the human brain, function of the brain lobes
- Nerve cell structure, resting and action potential
- Neurotransmitters and synaptic transmission
- The structure of the human eye
- Mechanism of vision
- The structure of the human auditory system and the mechanism of hearing
- The olfactory system

3. Genetics

- The Laws of Mendel
- Structure of the genes
- Levels of gene expression
- Mutations: types and consequences
- Human chromosome number aberrations, genetic diseases
- Dominant-recessive inheritance
- Sex-linked inheritance
- The genetic code
- The lactose operon

4. Evolution

- Darwin's theory
- Origin of life

Recommended reading:

Life, The science of biology (last edition)

II. Chemistry

1. General and Inorganic Chemistry

- Elements and compounds. The mole concept, Avogadro's number
- Basic structure of atoms and the quantum numbers
- Periodic table. Periodic properties
- Types of chemical bonding
- Lewis structure. Geometry of molecules
- Intermolecular forces. Types of solids
- Chemical equilibrium. Le Chatelier's principle. Examples for chemical equilibrium
- Acid-base theories
- Definition of pH, the pH scale. Examples for strong and weak acids and bases
- Solutions. Ways of expressing composition of solutions
- Definition of oxidation and reduction. Examples for redox reactions.
- Carbon and its inorganic compounds
- Nitrogen and its compounds
- Phosphorous and its compounds
- Sulfur and its compounds

2. Organic Chemistry

- Functional groups. Types of organic chemical reactions
- Isomerism in organic compounds. Types and examples
- Alkanes. Nomenclature, physical and chemical properties
- Alkenes and alkynes. Nomenclature, physical and chemical properties
- Aromatic hydrocarbons: examples, chemical reactions
- Alcohols: classification, preparation, physical properties
- Alcohols: chemical properties and most important representatives
- Ethers and phenols
- Oxo compounds: classification and oxidation-reduction reactions
- Carboxylic acids. Nomenclature, physical and chemical properties
- Carboxylic acid derivatives: esters and amides
- Amines: classification, nomenclature, examples for their chemical reactions
- Proteinogenic amino acids: examples. The peptide bond
- Carbohydrates: definition, classification, most important representatives
- Components of nucleic acids