

ENTRANCE EXAMS – 6 GVM

DATES: 11th May 2017 or 6th July 2017 or 17th August 2017

VENUE: UVMP in Košice, Slovakia

(Additionally, in case of a sufficient interest amongst applicants, arrangements can be made for the tests to be taken at The Embassy of the Slovak Republic in Oslo in Norway. Such interest must be confirmed by the applicant in writing when submitting the application form.)

SUBJECTS: Biology and Chemistry

(The tests are set at the level of the secondary school leaving examination.)

LANGUAGE: English

**FORM: Written test (single, multiple choice and open ended questions).
Applicable questions types to be confirmed at the entrance exams.**

PARTICIPANTS: Applicants for the 6-year GVM study programme

Admission requirements – BIOLOGY (Academic Year 2017/2018)

1. **The Science of Biology** (History of Biology, Interdisciplinary sciences, Dividing of sciences)
2. **Characteristics of Living Thing** (Basic Life Characteristics - Order, Adaptations, Metabolisms, Movement, Responsiveness, Reproduction, Development, Genes, Evolution)
3. **Classification of living system** (Subcellular organisms – prions, viroids, virusoids, virus – composition, classification, replication cycle; Unicellular organisms, Multicellular organisms)
4. **Cell as the basic unit of life and Cell Structures** (Anatomy of prokaryotic and eukaryotic cell and differences, Cell structures)
5. **The Basic Elements of Organisms** (Organic compounds – Proteins, Nucleic Acids (DNA, RNA), Carbohydrates, Lipids - basic characterization - functions, structure, composition)
6. **Enzymes** (Characterization of enzymes; Mode of action of enzymes - active site, enzyme/substrate complex, lowering of activation energy and enzyme specificity)

7. **Cell Membranes and Transport** (Composition of cell membranes; Movement of substances into or out of cells - passive and active transport - Diffusion, Facilitated diffusion, Osmosis, Endocytosis – definition, types – Phagocytosis, Pinocytosis; Exocytosis, Homeostasis)
8. **Cell Cycle** (Phases of the cycle, Mitosis, Meiosis)
9. **Gene Expression** (Genetic code, Transcription, Translation, Types of RNA)
10. **Harvesting of Energy by Living organisms** (Energy fixation - autotrophs, heterotrophs; Mitochondria and Cellular Respiration, ATP, Photosynthesis and Chloroplasts)
11. **Biological systems** (Circulatory system; Skeletal system; Reproductive system; Digestive system; Urinary system; Respiratory system; Endocrine system; Lymphatic system; Muscular system; Nervous system: collecting, transferring and processing information with brain, spinal cord and peripheral nervous system)
12. **Plant Biology** (Plant Tissues, Plant Growth and Development, Photosynthesis)
13. **Genetics** (Passage of genetic information from parent to offspring, Mendel's Laws, Nature of genes and alleles)
14. **Reproduction and Development** (Cells specialized for reproduction, Fertilization, Development)
15. **Ecology** (Levels of ecological organization, Energy flow through ecosystems, Interactions in ecosystems - biotic interactions, symbiotic relationship)
16. **Ethology** (Basic characterization of ethology, Instincts, Learning, Key principles and concepts)

EXAMPLE of questions from Biology test:

1. Meiosis results in:
 - a) two haploid cells
 - b) two diploid cells
 - c) four haploid cells
 - d) four diploid cells

2. The energetic centers of the cell are:
 - a) Plastids
 - b) Vacuoles
 - c) Mitochondria
 - d) Endoplasmic reticulum

3. Translation takes place on

Admission requirements – CHEMISTRY (Academic Year 2017/2018)

1. **Matter:** Classification of matter, states of matter, the chemical elements and their symbols, pure substance, compound, mixture.
Atomic weight, relative atomic weight, molecular weight, relative molecular weight.
2. **Atom:** Structure of atom, orbitals, shells, subshells, quantum numbers.
Electronic structure of atom, electron configuration, Pauli Exclusion Principle, Hund's rule, Build up principle. Atomic number, mass number, nuclide, isotope.
Mole, Avogadro's number, molar mass. Conversion of units.
3. **Periodic table:** groups or families, periods, representative elements, transition elements, inner transition elements, alkali metals, alkaline earth metals, halogens, noble gases.
4. **Chemical bond:** Electronegativity, ionic bond, covalent bond, multiple covalent bonds.
5. **Naming:** IUPAC naming of inorganic compounds (binary compounds, salts, acids, bases).
6. **Chemical reaction:** Chemical equations, balancing chemical equations.
Classification of chemical reactions, protolytic reactions, redox reactions, precipitation, reaction rate, factors affecting reaction rate, catalysts, exothermic and endothermic reactions, chemical equilibrium, equilibrium constant.
7. **Solution:** definition of solution, solubility, composition of solutions, mass percentage, molar concentration, units of concentration, calculation of solution composition.
8. **Dissociation:** electrolytes, acids, bases, salts. Brønsted-Lowry theory of acids and bases, acid/bases dissociation, acid and base strength, dissociation constant, ionization of water, pH definition, pH of acid/base solutions, hydrolysis of salts.
9. **Organic chemistry:** Families of organic molecules, functional groups, molecular structure of organic compounds. Principles of IUPAC nomenclature. Reactions of organic compounds.
10. **Hydrocarbons:** Alkanes, cycloalkanes, alkenes, alkynes, aromatic compounds – naming, properties, reactions, some important structures, common names.
11. **Derivatives of aliphatic and alicyclic hydrocarbons:** Halides, sulfonic acids, nitro derivatives, amines, alcohols, ethers, thiols, disulphides, aldehydes, ketones, carboxylic acids – naming, physical and chemical properties, reactions, some important structures.
12. **Derivatives of aromatic hydrocarbons:** Aromatic halides, benzene sulfonic acids, nitro derivatives, aromatic amines, phenols, aromatic aldehydes, ketones and carboxylic acids – naming, physical and chemical properties, reactions, some important structures.

13. **Derivatives of carboxylic acids:** Salts, esters, anhydrides, amides, acyl halides - naming, basic properties, reactions.
14. **Derivatives of carboxylic acids:** Halide acids, amino acids, keto (oxo) acids, hydroxy acids - naming, basic properties, reactions, some important structures.
15. **Carbohydrates:** Classification, physical and chemical properties, stereoisomerism, important reactions (oxidation, reduction, formation of hemiacetals and acetals), glycosidic bond, oligosaccharides, important disaccharides, polysaccharides (starch, glycogen, cellulose).
16. **Lipids:** classification, physical and chemical properties, fatty acids, alcohols in lipids, fats and oils, waxes. Esterification and hydrolysis.
17. **Proteins:** Formation and structure of peptides, properties, primary, secondary, tertiary and quaternary structure of proteins, isoelectric point.
18. **Heterocyclic compounds:** 5-membered and 6-membered heterocycles, classification, naming, chemical properties, some important structures.

EXAMPLE of questions from Chemistry test:

1. Name the compound: NaNO_2
2. The atom has $Z = 17$ and $A = 36$. How many protons are in this atom?
3. Which of the solutions is the most basic?
 - a) $\text{pH} = 12.0$
 - b) $\text{pOH} = 12.0$
 - c) $\text{pH} = 3.0$
 - d) $\text{pOH} = 3.0$
4. Give the common name for the following compound:



5. What is the IUPAC name of the following hydrocarbon?
 $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{CH}_3$