

**LITHUANIAN UNIVERSITY OF HEALTH SCIENCES**

**Topics Required for the Entrance Examination MCQ**

Academic Year 2016/2017

# BIOLOGY

## 1. Cell Biology

Levels of biological organization. Biologically important elements. Biopolymers.

Microscope (optic, electron).

Heterotrophy, autotrophy. Prokaryotes and eukaryotes. Multicellularity.

Cell structure. Cell membrane. Cytoplasm. Endoplasmic reticulum. Golgi complex.

Mitochondria. Ribosomes. Lysosomes. Vacuoles. Cytoskeleton. Cilia, flagella.

Centrioles.

Basic life functions: ingestion, digestion, secretion, absorption, respiration, excretion, transport, regulation, synthesis, assimilation, reproduction, irritability, movement.

Nucleus. Nuclear envelope. Diffusion through a cell membrane. Active transport.

Endocytosis. Phagocytosis. Exocytosis. Energy production.

Cell division. Mitosis. Cell cycle. Simple organisms (ameba, paramecium, bacteria, viruses).

## 2. Genetics

Meiosis and sexual reproduction. Fertilization. Diploidy. Haploidy. Polyploidy.

Zygote. Comparison of meiosis and mitosis. Spermatogenesis and oogenesis.

Mendel's laws. Mutations. Mutations and evolution.

Genes and gene interactions. Autosomes. Sex chromosomes. Gene linkage. Crossing over. Recombination. DNA. DNA replication.

Human karyotype. Human karyotype abnormalities.

## 3. Human Anatomy and Physiology

Tissues: epithelial, nerve, muscle, connective. Digestive tract: oral cavity, pharynx, esophagus, stomach, small intestine, large intestine. Liver, pancreas. Nutritional requirements.

Respiration. Lungs. Hemoglobin and its function. Inspired and expired air.

Blood circulation. Heart. Blood vessels. Lymphatic system.

Blood, plasma, red blood cells, white blood cells. Blood clotting, platelets.

Immune system, immune response. B lymphocytes, T lymphocytes.

Endocrine system. Hypophysis, adrenal, thyroid, parathyroid glands. Hormones.

Kidney, excretion. Glomerulus.

Nervous system. Evolution. Nerve impulses. Cerebral cortex. Response to sensory information. Muscle contraction.

Reproduction. Male and female reproductive system.

## EXAMPLE OF MULTIPLE CHOICE QUESTIONS

1. Sex chromosomal pattern in mammals is:

A) XY – female, XX – male

B) YY – female, XX – male

C) XX – female, YO – male

D) XX – female, XY - male

# CHEMISTRY

## General and Inorganic Chemistry

1. Structure of the atom.

- Electronegativity. Oxidation numbers. Types of chemical bonds.
- Nomenclature of inorganic and organic compounds.
- Types of chemical reactions.
- Chemical equations and their balancing. Stoichiometry.
- Definition of oxidation and reduction. Oxidizing and reducing agents. Balancing oxidation-reduction equations.
- Chemical equilibrium and equilibrium constant. Le Chatelier's principle.
- Reaction rate. Factors influencing the rate of a chemical reaction.
- States of matter.
- Solutions and solubility. Concentration and related calculations.
- Electrolytes and nonelectrolytes. Ionization. Arrhenius and Bronsted-Lowry definitions of acid and base.
- Ionization of water. pH. Calculations of pH of a strong acid or base.
- Hydrolysis of salts.
- Electrolysis. Electrolytic cells.
- Periodic table of elements. General characteristic of the groups.
- The utilization of the periodic table for predicting oxidation numbers. Properties, chemical formulas and types of bond within the compounds.

### **Organic Chemistry**

- Classification of organic compounds. Isomers.
- Saturated, unsaturated and aromatic hydrocarbons.
- Organic halides.
- Alcohols, phenols and ethers.
- Aldehydes and ketones.
- Carboxylic acids (mono- and polyfunctional).
- Functional and substitutional derivatives of carboxylic acids.
- Amines. Nitro compounds.
- Monosaccharides, disaccharides, and polysaccharides.
- Triglycerides. Fats and oils.
- Amino acids. Peptides. Proteins.

### **EXAMPLE OF MULTIPLE CHOICE QUESTIONS**

- Which of the following compounds is produced when fatty acid reacts with sodium hydroxide?
  - soap
  - ester
  - aldehyde
  - alcohol

### **The following books are recommended for preparation to the MCQ Test:**

- Sylvia Mader, Michael Windelspecht. Biology. 12th Edition. McGraw-Hill Education, 2015. ISBN-13: 978-0078024269 ISBN-10:0078024269. Previous Edition (10th, 11th) also suitable.
- CK-12 Foundation Biology:

[https://upload.wikimedia.org/wikipedia/commons/c/ce/High\\_School\\_Biology\\_1-13.pdf](https://upload.wikimedia.org/wikipedia/commons/c/ce/High_School_Biology_1-13.pdf)

[https://upload.wikimedia.org/wikipedia/commons/b/b1/High\\_School\\_Biology\\_14-26.pdf](https://upload.wikimedia.org/wikipedia/commons/b/b1/High_School_Biology_14-26.pdf)

- 3) Joseph A. Mascetta M.S, Mark Kernion. Barron's SAT Subject Test Chemistry, 12th Edition, Eds.
- 4) Morris Hein, Scott Pattison, Susan Arena, Leo R. Best. Introduction to General, Organic, and Biochemistry. Willey, 2012.
- 5) James E. Brady, Neil D. Jespersen, Alison Hyslop. Chemistry, Willey, 2015 (2012).
- 6) Leo J. Malone, Theodore O. Dolter. Basic Concepts of Chemistry, Willey, 2013.
- 7) J. Clayden, N. Greeves, S. Warren. Organic chemistry, Oxford University Press, 2012.

Some less recent editions of these books are likely to be quite satisfactory and other books, which cover the topics of the exam.