

**MEDICAL UNIVERSITY - PLOVDIV**  
**Department of Languages and Specialized Training**  
**Section of Natural Sciences**

**PROGRAM**

**Biology for preparing year foreign students in Medicine, Dental Medicine and  
Pharmacy**

**Confirmed by the Department Council on 23th of January 2025 /Proceedings № 3**

**MEDICAL UNIVERSITY PLOVDIV**  
**Department of Languages and Specialized Training**  
**Section of Natural Sciences - Biology**

**Course name:**

Biology for preparing year foreign students in Medicine, Dental Medicine and Pharmacy

**Type of course according to the Uniform State Requirements:**

Mandatory

**Level of Education:**

Preparatory course

**Form of Education:**

Lecture and lecture and practical exercises

**Duration of the education:**

Two semesters, 30 weeks

**Auditorium classes:**

160 hours (lectures 30 h + lecture and practical lessons 130 h)

**Technical equipment applied in the training:**

Multimedia presentations, anatomical skeleton, anatomy atlases, drawings, tests, specialized dictionaries with medical and biological terminology

**Control and evaluation:**

- Ongoing evaluation – weekly tests, oral examinations, colloquium
- Final evaluation – combined written test

**Formation of the final grade:**

The final grade is based on the mark from the final combined test exam

**Aspects in the formation of the final grade:**

Active participation during lessons, results from test exams, colloquium and final exam

**Semester exam:**

Yes/Written examination

**State exam:**

No

**Lecturer:**

Leading teacher (PhD) from Natural Sciences section

**Section:** Natural Sciences

## ANOTATION

The discipline Biology allows students from preparatory course to acquire knowledge and skills in the following basic biological concepts:

- selected and adapted minimum of medical and biological terminology
- scientific vocabulary in disciplines cytology, histology, anatomy, physiology, molecular and cell biology, immunological homeostasis

The following methods of education are used:

- Methods for building verbal communication skills using medical-biological terminology and scientific vocabulary
- Methods for control and evaluation of the knowledge
- Methods of communicative competence of the disciplines studied
- Inductive, deductive, interdisciplinary and integral approach
- Motivational approach

## COURSE TASKS

The main tasks of the curriculum are determined by the program and content of the medical and biological disciplines studied in the first and second year in Medicine, Dental Medicine and Pharmacy. The aim is to acquire the knowledge and skills needed in the next level of training.

The tasks are as follows:

- Undergraduate level of biology knowledge in English to enable students to participate fully in the initial stage of the educational process in the respective faculty
- A free use of biological terminology in English and understanding the specifics of the scientific style
- Professional orientation training
- Education in humane principles
- Targeted education of friendly relationships in order to increase the effectiveness of the learning process

## OBLIGATORY COMPETENCIES

1. Theoretical knowledge:

- to have communicative competence and to be able to apply knowledge in order to understand the information in first and second year of education
- to be able to understand and analyze the medical and biological texts in English on the disciplines studied
- to know and apply modern methods and tools for biology education
- to know and apply methods for their personal improvement
- to know and use the scientific style in the medical-biological disciplines studied
- to cover the exam and test requirements

## CURRICULUM

Type of courses	Course hours				
	Duration	Weekly	I semester	II semester	Total
Lectures	2	2 (each second week)	10	20	30
Lecture and practical exercises	2 or 3	5 or 10	60	70	130

## PROGRAM

<b>Biology 2024/2025</b>		
<b>I semester (14 weeks)</b>		
<b>Introductory course – 20 h</b>		
		Hours
1	Cell 1	2
2	Cell 2	3
3	Tissues	2
4	Organs and Systems 1	3
5	Organs and Systems 2	2
6	Organs and Systems 3	3
7	Organism Properties - Life Processes. Relationships between the organisms	2
8	Exercises. Test № 1	3
<b>Lectures – 10 h, Lecture and Practical lessons - 40 h</b>		
9	<b>Lecture 1: Cell, Tissues</b>	2
10	The Cell – the first level of the structural organization of the human organism	3
11	Tissues. Tissue Types: epithelial, connective. Characteristics, classification, functions	2
12	Tissues. Tissue Types: muscle, nervous. Characteristics, classification, functions	3
13	<b>Lecture 2: Digestive system</b>	2
14	Digestive system. Nutrition. Digestion in the mouth	3
15	Digestive system. Digestion in the stomach and intestines	2
16	Hygiene of nutrition. Health related knowledge about the digestive system	3
17	<b>Lecture 3: Respiratory system</b>	2
18	Respiratory system. Nose, pharynx, larynx, trachea, lungs	3
19	Respiratory system. Respiration. Hygiene and health	2
20	Exercises. Test № 2	3
21	<b>Lecture 4: Urinary system</b>	2
22	Urinary system. Excretion. Hygiene and health	3
23	<b>Lecture 5: Cardiovascular system</b>	2
24	Cardiovascular system. Heart and blood vessels	3
25	Cardiovascular system. Blood	2
26	Cardiovascular system. Heart activity. Blood circulation	3
27	Immunity. Hygiene and health related knowledge about the cardiovascular system.	2
28	Exercises. Test № 3	3
<b>Lectures – 20 h, Lecture and Practical lessons - 70 h</b>		
29	<b>Lecture 6: Locomotive system</b>	2
30	Locomotive system. Structure of bones and joints. Skull	3
31	Locomotive system. Vertebral column, chest and limbs	2
32	Locomotive system. Muscles. Body movement and support	3
33	<b>Lecture 7: Reproductive system</b>	2
34	Reproductive system. Male reproductive system	3
35	Reproductive system. Female reproductive system. Fertilization. Embryonic and postnatal development. Reproductive system and development	2
36	Exercises. Test № 4	3
37	<b>Lecture 8: Nervous system</b>	2
38	Nervous system. Spinal cord	3
39	Nervous system. Brain	2
40	Nervous system. Cerebrum. Autonomic nervous system	3

41	<b>Lecture 9: Endocrine system</b>	2
42	Endocrine system. Pituitary gland, epiphysis, thyroid gland, parathyroid glands	3
43	Endocrine system. Pancreas, adrenal glands, sex glands	2
44	Exercises. Test № 5	3
45	<b>Lecture 10: Sensory systems and skin</b>	2
46	Sensory systems. Visual sensory system	3
47	Auditory, balance, taste, olfactory sensory systems, system of common sensitivity. Skin	2
48	Exercises. Colloquium	3
49	<b>Lecture 11: Chemical composition of the cell</b>	2
50	Carbohydrates and lipids	3
51	Proteins. Enzymes	2
52	Nucleic acids	3
53	<b>Lecture 12: Viruses, prokaryotic and eukaryotic cells</b>	2
54	Supramolecular complexes. Viruses.	3
55	Cell – the basic unit of the living matter.	2
56	Prokaryotic cell. Eukaryotic cell	3
57	<b>Lecture 13: Cell organelles</b>	2
58	Cell membrane. Nucleus	3
59	Non-membrane bound, single-membrane and double-membrane bound organelles	2
60	Exercises. Test № 6	3
61	<b>Lecture 14: Genetic processes</b>	2
62	Replication, transcription and translation	3
63	<b>Lecture 15: Types of cell division</b>	2
64	Cell division. Mitosis. Meiosis. Cell cycle	3

**LECTURE EXERCISE COURSE SYNOPSIS  
2024/2025**

**I SEMESTER - 14 WEEKS**

**LESSON 1 – 2 hours. Introductory Course. Cell 1**

Cell organelles. Double membrane organelles, single membrane organelles, non-membrane organelles – terminology.

**LESSON 2 – 3 hours. Introductory Course. Cell 2**

Cell organelle functions. Chemical compound of the cell: organic and neorganic substances – terminology.

**LESSON 3 – 2 hours. Introductory Course. Tissues**

Epithelial, connective, muscular and nervous tissue - terminology

**LESSON 4 – 3 hours. Introductory Course. Organs and Systems 1**

Locomotive system. Digestive system. Cardiovascular system – terminology.

**LESSON 5 – 2 hours. Introductory Course. Organs and Systems 2**

Respiratory system, Excretory system, Reproductive system, Endocrine system – terminology.

**LESSON 6 – 3 hours. Introductory Course. Organs and Systems 3**

Nervous system, Sensory systems – terminology.

**LESSON 7 – 2 hours. Introductory Course. Organism Properties - Life Processes. Relationships between the Organisms**

Feeding (Nutrition), Respiration, Excretion, Growth, Reproduction, Movement, Responsiveness, Variation, Heredity – definitions. Symbiosis, Synnecrosis, Commensalism, Amensalism, Parasitism, Mutualism – definitions, examples.

**LESSON 8 – 3 hours. Introductory Course. Exercises. Test № 1**

Cell – terminology. Tissues, organs and systems – terminology. Organism properties – definitions. Relationships between the organisms – definitions.

**LESSON 9 – 2 hours. Lecture 1: Cell, Tissues**

**LESSON 10 – 3 hours. The Cell – the first level of the structural organization of the human organism**

Cell – smallest living system in nature. Chemical composition of cells. Structure of the cell. Cell division

**LESSON 11 – 2 hours. Tissues. Tissue Types: epithelial, connective. Characteristics, classification, functions**

Tissues. Tissue types – classification. Epithelial tissue. Surface (simple, stratified) and Glandular epithelium. Secretions – types. Connective tissue – general characteristics. Specialized connective tissues: reticular, loose, adipose, blood, bone, cartilaginous tissue.

**LESSON 12 – 3 hours. Tissues. Tissue Types: muscle, nervous. Characteristics, classification, functions**

Muscle tissue – general characteristics. Smooth, striated and cardiac muscle tissue. Nervous tissue – general characteristics. Nervous cells: neurons and neuroglial cells. Synapses and neurotransmitters

**LESSON 13 – 2 hours. Lecture 1: Digestive system**

**LESSON 14 – 3 hours. The digestive system. Nutrition. Digestion in the mouth.**

Nutrition as a major vital process. Nutrients: proteins, carbohydrates, lipids, water, mineral salts, vitamins. Digestion. Digestion in the mouth. Oral cavity. Tongue – structure and function. Teeth – structure and function. Deciduous and permanent teeth. Teeth types: incisors, canines, molars, premolars. Wisdom teeth. Salivary glands and saliva. Enzymes. Pharynx – structure and function. Oesophagus– structure and function. Peristalsis. Regulation of digestion in the mouth.

**LESSON 15 – 2 hours. Digestive system. Digestion in the stomach and intestines**

Stomach – structure and function. Stomach juice – enzymes. Small intestine – structure and function. Intestinal juice – enzymes. Pancreas – structure and function. Pancreatic juice – enzymes. Liver – structure and function. Gall bladder – structure and function. Bile. Absorption. Large intestine – structure and function. Regulation of digestion in the stomach and intestines

**LESSON 16 – 3 hours. Hygiene of nutrition. Health related knowledge about the digestive system**

Hygienic rules and norms. Dietary regime. Hygiene and preparation of food. Hygiene of the digestive system. Food poisoning, tooth diseases, gastritis, ulcer, hepatitis, cirrhosis, colitis, appendicitis, obesity, wasting syndrome

**LESSON 17 – 2 hours. Lecture 3: Respiratory system**

**LESSON 18 – 3 hours. Respiratory system. Nose, pharynx, larynx, trachea, lungs**

Respiratory system. Breathing passages (respiratory pathways): Nose, nasal cavity, olfactory organ, larynx, vocal cords, vocal gap, trachea, bronchi, bronchioles. Organs of gas exchange: lungs, pleura, alveoli.

**LESSON 19 – 2 hours. Respiratory system. Respiration. Hygiene and health related knowledge about the respiratory system**

Respiratory movements: inspiration (inhalation) and expiration (exhalation). Vital capacity. Breathing (respiratory) rate. Gas exchange in the lungs. Gas exchange in the tissues. Regulation of breathing. Hygienic rules and norms. Excessive intake of foods rich in fats and carbohydrates. Sports and hiking in nature. Content of the air. Cigarette smoke and smoking. Common cold, influenza (Flu), tonsillitis, laryngitis, tracheitis, bronchitis, bronchial asthma, pneumonia, lung tuberculosis, lung cancer.

**LESSON 20 – 3 hours. Exercises. Test № 2**

Tissues. Digestive and respiratory systems

**LESSON 21 – 2 hours. Lecture 4: Urinary system**

**LESSON 22 – 3 hours. Urinary system. Excretion. Hygiene and health related knowledge about the urinary system**

Excretory system. Kidney structure: cortex, medulla and pelvis. Nephron. Malpighian body structure: glomerulus, renal capsule, convoluted canal. Collecting duct. Ureter, urinary bladder, urethra – structure and function. Urine production: filtration, selective reabsorption, secretion. Regulation of excretion. Kidney disorder and insufficiency. Haemodialysis and dialysis machine. Kidney stones, glomerulonephritis, pyelonephritis, cystitis, urethritis.

**LESSON 23 – 2 hours. Lecture 5: Cardiovascular system**

**LESSON 24 – 3 hours. Cardiovascular system. Heart and blood vessels**

Heart structure: chambers – right and left atria, right and left ventricles; valves – atrioventricular and semilunar valves; layers – epicardium, myocardium, endocardium. Pericardium. Blood vessels. Arteries and arterioles. Arterial wall structure. Veins and venules. Venous wall structure. Capillaries. Blood supply of the heart wall

**LESSON 25 – 2 hours. Cardiovascular system. Blood**

Blood. Blood plasma. Blood clotting (coagulation). Blood cells: erythrocytes, leucocytes, thrombocytes. Blood groups. Blood group antigens. Blood group antibodies. Rhesus factor. Agglutination.

**LESSON 26 – 3 hours. Cardiovascular system. Heart activity. Blood circulation**

Heart function. Cardiac cycle. Systole and diastole. Heart rate. Pulse. Heart sounds. Blood pressure. Systemic and pulmonary circulation. Systemic circulation: left ventricle – aorta – body – venae cavae – right atrium. Pulmonary circulation: right ventricle – pulmonary artery – lungs – pulmonary veins – left atrium. Regulation of blood circulation. Internal liquid environment of the body. Lymph. Lymph circulation. Tissue liquid

**LESSON 27 – 2 hours. Immunity. Hygiene and health related knowledge about the cardiovascular system.**

Immunity. Innate and acquired immunity. Antigens and antibodies. Vaccination and immunisation. Allergies. Hygienic rules and norms. Living conditions and lifestyle leading to social diseases: training of the heart muscle, diet, chemical factors, risk situations leading to blood-borne infections, stress and fatigue. Hypotension, hypertension, atherosclerosis, myocardial infarction (heart attack), brain insult (stroke), leukemia

**LESSON 28 – 3 hours. Exercises. Test № 3**

Excretory and cardiovascular systems

## II SEMESTER – 16 WEEKS

### **LESSON 29 – 2 hours. Lecture 6: Locomotive system**

#### **LESSON 30 – 3 hours. Locomotive system. Structure of bones and joints. Skull**

Composition and structure of bones. Shape of bones: long, short, flat and irregular bones. Growth of bones. Bone connections: immobile, semi-mobile and mobile (joints). Skeleton. Bones of the Skull: cerebral (cranial) and facial bones

#### **LESSON 31 – 2 hours. Locomotive system. Vertebral column, chest and limbs**

Vertebral column. Vertebral column shape and functions. Vertebra – structure. First and second vertebrae: atlas, axis. Vertebral types: cervical, thoracic, lumbar. Sacral bone. Coccygeal bone. Rib cage. Rib cage shape and functions. Rib cage structure: breast bone, ribs, thoracic vertebrae. Types of ribs: true, false and floating. Bones of the upper limb. Shoulder girdle: clavicle, shoulder blade; Free upper limb: arm – humerus; forearm – ulna, radius; hand – wrist bones, metacarpals, phalanges. Joints: shoulder, elbow and wrist joints. Bones of the lower limb. Pelvic girdle: hip bone – ilium, ischium, pubis; Free lower limb: thigh – femur; patella; leg – tibia, fibula; ankle – tarsal bones; foot – metatarsal bones, phalanges. Joints: hip, knee and ankle joints.

#### **LESSON 32 – 3 hours. Locomotive system. Muscles. Body movement and support**

Skeletal muscles. Muscle structure. Muscle types: fusiform, flat and circular; flexors, extensors, abductors, adductors. Muscles of the head: for facial expression, for mastication; neck and trunk: abdominal, breast spine muscles. Muscles of the upper limb. Muscles of the lower limb. Action of muscles. Function of muscles. Muscle tone. The physiological properties of muscles. Muscle strength. Muscle work. Locomotive System and Health: scoliosis, discopathy, splayfoot, osteoporosis.

### **LESSON 33 – 2 hours. Lecture 7: Reproductive system**

#### **LESSON 34 – 3 hours. Reproductive system. Male reproductive system**

Male reproductive system: Testes, epididymides, sperm ducts (vasa deferentia), seminal vesicles, prostate gland, penis, scrotum – structure and function. Erection and ejaculation.

#### **LESSON 35 – 2 hours. Reproductive system. Female reproductive system. Fertilization. Embryonic and postnatal development. Reproductive system and development**

Female reproductive system: ovaries, uterine tubes (oviducts), uterus, vagina, hymen, clitoris, large and small labia, mammary glands – structure and function. Ovulation and menstruation. Gametes and sex hormones. Sexual and Reproductive Health. Fertilization. Embryonic development. Birth. Postnatal development: newborn period, breastfeeding period, early childhood, preschool age, school age and puberty, adulthood, old age, death.

#### **LESSON 36 – 3 hours. Exercises. Test № 4**

Locomotive and reproductive systems

### **LESSON 37 – 2 hours. Lecture 8: Nervous system**

#### **LESSON 38 – 3 hours. Nervous system. Spinal cord**

Nervous system. General Structure and Principles of Activity. Spinal cord structure: white and grey matter, afferent and efferent nerve bundles. Spinal nerves structure: anterior (motor) and posterior (sensitive) roots, afferent and efferent fibers, insulation layer – myelin

sheath. Spinal cord functions: transmitting and reflexive. Reflex arc: receptor, sensory nerve, nervous center, motor nerve, reacting organ (effector).

**LESSON 39 – 2 hours. Nervous system. Brain**

Brain structure. Brain stem: medulla oblongata, pons, mesencephalon(midbrain),. Cerebellum. Diencephalon: thalamus, hypothalamus. Cranial nerves

**LESSON 40 – 3 hours. Nervous system. Cerebrum. Autonomic nervous system**

Cerebrum (telencephalon): right and left hemisphere, cortex, corpus callosum, brain ventricles, meninges, cerebrospinal liquid. Frontal, temporal, parietal and occipital lobes. Brain functions. Motor, common sensitivity, taste, visual, auditory and vestibular areas. Higher nervous activity. Unconditioned and conditioned reflexes. Autonomic nervous system structure: sympathetic and parasympathetic parts. Autonomic nervous system function. Hypothalamic control of the autonomic nervous system.

**LESSON 41 – 2 hours. Lecture 9: Endocrine system**

**LESSON 42 – 3 hours. Endocrine system. Pituitary gland, epiphysis, thyroid gland, parathyroid glands**

Endocrine System – structure and functions. Hormonal regulation – negative feedback. Pituitary gland. Hormones of the anterior part. Hormones of the posterior part. Thyroid gland. Epiphysis (pineal gland). Parathyroid glands. Endocrine system and health. Hypofunction and hyperfunction of the gland.

**LESSON 43 – 2 hours. Endocrine system. Pancreas, adrenal glands, sex glands**

Endocrine System. Pancreas. Adrenal (suprarenal) glands. Sex glands. Hormones and effects. Endocrine system and health. Hypofunction and hyperfunction of the glands.

**LESSON 44 – 3 hours. Exercises. Test № 5**

Endocrine and nervous systems.

**LESSON 45 – 2 hours. Lecture 10: Sensory systems and skin**

**LESSON 46 – 3 hours. Sensory systems. Visual sensory system**

General structure and functions of the sensory systems: peripheral (sensory organs), conductive (sensory nerves) and cortical (sensory areas in the cortex). Visual sensory system. Human eye – structure and function.

**LESSON 47 – 2 hours. Sensory systems. Auditory, balance, taste, olfactory sensory systems, system of common sensitivity. Skin.**

Sensory Systems. Auditory sensory system: external, middle and inner ear, organ of Corti. Vestibular (balance) sensory system: vestibular apparatus. Gustatory (taste) sensory system: tongue taste receptors (buds). Olfactory (smell) sensory system: olfactory organ. Somatosensory system: receptors for heat/cold, pain, touch, pressure, vibration. Kinesthetic sensory system. Skin. Skin layers: epidermis, dermis, hypodermis. Sweat glands – structure and functions. Sebaceous (oil) glands - structure and functions. Hairs and nails. Skin functions: protective, thermoregulative, sensory, excretory, respiratory, reserve function. Skin hygiene

**LESSON 48 – 3 hours. Exercises. Colloquium**

Cells, tissues, organs and systems

**LESSON 49 – 2 hours. Lecture 11: Chemical composition of the cell**

**LESSON 50 – 3 hours. Chemical composition of the cell**

Chemical elements in the cell: macro-, oligo- and microelements. Chemical compounds in the cell: organic and inorganic compounds. Monomers and polymers (biopolymers). Water in the cell. Structure of the water molecule. Properties of water. Biological functions of water. Mineral salts. Carbohydrates: monosaccharides, oligosaccharides, polysaccharides. Solubility and properties of carbohydrates. Glycogen, starch, cellulose. Lipids: fatty acids, fats, triglycerides, phospholipids, steroids, carotenoids, waxes

### **LESSON 51 – 2 hours. Proteins. Enzymes**

Protein structure: amino acids, polypeptide chains. Levels of organization of proteins: primary, secondary, tertiary and quaternary structure. Protein functions: structural, catalytic, regulative, transport, active and passive protective, contractile, receptor and energy source. Shape of the protein molecule. Protein properties: denaturation and renaturation. Enzymes. Properties of enzymes. Nature of enzymes: one component and two component enzymes. Mechanism of enzyme action. Factors affecting the enzyme activity: temperature, acidity of the medium, substrate concentration, activators and inhibitors. Practical application of the enzymes

### **LESSON 52 – 3 hours. Nucleic acids**

Nucleic acids. Polynucleotide chains. Nucleotide (monomer) structure: pentose sugar, phosphate acid residue and nitrogen base. DNA structure – double helix. DNA – main hereditary molecule. Genetic code. Structure of RNA– single stranded. The monomer of RNA: ribonucleotide. Main RNA types. Messenger RNA (mRNA). Transfer RNA (tRNA). Ribosomal RNA (rRNA). RNA functions. Central dogma in biology.

### **LESSON 53 – 2 hours. Lecture 12: Viruses, prokaryotic and eukaryotic cells**

#### **LESSON 54 – 3 hours. Supramolecular complexes. Viruses.**

Cellular and non-cellular supramolecular complexes. Structure of viruses: capsid, capsomers, DNA (RNA) core. Reproduction of viruses. Virion – definition. Bacteriophages (phages). Structure of phages: head, tail, tail fibers. Reproduction of phages. Origin of viruses. Viruses – agents of diseases. Spreading of viral infections. AIDS. HIV. Viroids. Prions.

#### **LESSON 55 – 2 hours. Cell – the basic unit of the living matter**

Cell – the smallest biological system. Cell theory. The main postulates of the cell theory. The cell as a level of organization of the living matter. Devices for microscopic observation

#### **LESSON 56 – 3 hours. Prokaryotic cell. Eukaryotic cell**

Prokaryotic cells. Eubacteria. Structure: cell membrane, cell wall, nucleoid (bacterial chromosome), pili, flagella, spores. Types: cocci, bacilli, spirilla. Nutrition of bacteria: heterotrophs (parasites and saprophytes) and autotrophs. Respiration of bacteria: aerobes and anaerobes. Spore formation. Cyanobacteria. Importance of bacteria. Infectious diseases. Eukaryotic cell. Shape and size of cells. Inner structure of the cells: cell membrane, cytoplasm, nucleus. Cell organelles. Common (universal) organelles: membrane-bound and non-membrane-bound organelles. Importance of the membranes in the eukaryotic cells. Specialized organelles.

#### **LESSON 57 – 2 hours. Lecture 13: Cell organelles**

#### **LESSON 58 – 3 hours. Cell membrane. Nucleus**

Plasmalemma. Structure of the cell membrane: fluid-mosaic model. Transport of substances across the cell surface membrane: passive and active. Osmotic pressure. Diffusion. Cytoses: endocytosis (phagocytosis and pinocytosis), exocytosis. Specialized structures of the cell membrane: cilia, flagella, microvilli. Nucleus. Structure of the cell nucleus: nuclear envelope, pores, nuclear sap. Chromatin. Nucleoli. Main functions of the nucleus. Chromosome structure before (incompact) and during (compact) cell division. Chromosome

types: metacentric, submetacentric and acrocentric. Chromosome set – karyotype. Levels of organization of chromatin: DNA double helix, beads on a string, chromatin fiber, scaffold associated chromatin loops, chromatid. Euchromatin and heterochromatin. Sex chromatin

### **LESSON 59 – 2 hours. Non-membrane, single-membrane and double-membrane bound organelles**

Non-membrane bound organelles. Ribosomes. Structure of ribosomes: small and large subunits. Cytoskeleton: microfilaments, intermediate filaments, microtubules. Cell centre, centrioles. Single-membrane organelles. Endoplasmic reticulum: rough and smooth. Golgi complex – structure and function. Lysosomes – structure and function. Peroxisomes. Secretory vesicles. Vacuoles in animal and plant cells. Interaction between single-membrane organelles. Mitochondria. Structure of mitochondria: outer and inner membrane, cristae, matrix. Chloroplasts. Structure of chloroplasts: outer and inner membrane, thylakoid, stroma, granum. Chlorophyll. Origin of double-membrane organelles. Main energy source in eukaryotic cells. Adenosine triphosphate (ATP)

### **LESSON 60 – 3 hours. Exercises. Test № 6**

Chemical composition of the cell. Viruses, prokaryotic and eukaryotic cell. Cell organelles

### **LESSON 61 – 2 hours. Lecture 14: Genetic processes**

#### **LESSON 62 – 3 hours. Genetic processes. Replication. Transcription and translation.**

Characteristics of replication. Basic enzyme – DNA polymerase. Protein complex of replication – other enzymes: helicase, primase, topoisomerase. Primers and short DNA segments (Okazaki fragments). Stages of replication: initiation, elongation, termination. Characteristics of transcription. Basic enzyme – RNA polymerase. Transcriptional factors. Stages of transcription: initiation, elongation, termination. Post synthetic changes of RNA (maturation): precursor molecules, cap and tail, introns, exons, splicing. Characteristics of translation. Basic enzymes – aminoacyl tRNA synthetase, peptidyl transferase. Codons and anticodons. Translational factors. Stages of translation: initiation, elongation, termination.

### **LESSON 63 – 2 hours. Lecture 15: Types of cell division**

#### **LESSON 64 – 3 hours. Cell division. Mitosis and meiosis. Cell cycle**

Cell division. Mitosis - definition. Mitotic stages: prophase, metaphase, anaphase, telophase. Mitotic spindle. Cytokinesis. Biological significance of mitosis. Regulation of mitosis. Meiosis - definition. Meiotic stages: prophase I, metaphase I, anaphase I, telophase I, short interphase, prophase II, metaphase II, anaphase II, telophase II. Crossing over. Biological significance of meiosis. Cell cycle. Interphase and mitotic cycle.

### **Recommended literature**

1. V. Ovcharov, Dimitrov O., Yotovska K., Hristova M., Dimitrova T. 2018, Biology and Health Education, 9. Grade, Student's book, Part 1
2. V. Ovcharov, Dimitrov O., Yotovska K., Hristova M., Dimitrova T. 2018, Biology and Health Education, 9. Grade, Student's book, Part 2

### **Syllabus**

1. The Cell
2. Tissues. Epithelial and connective tissue
3. Tissues. Muscular and nervous tissue

4. The organism as an integral unit
5. Digestive system. Nutrition
6. Digestive system. Digestion in the mouth
7. Digestive system. Digestion in the stomach and intestines
8. Hygiene of nutrition. Health related knowledge about the digestive system
9. Respiratory system
10. Respiratory system. Respiration
11. Hygiene and health related knowledge about the respiratory system
12. Urinary system. Excretion
13. Hygiene and health related knowledge about the urinary system
14. Cardiovascular system. Heart and blood vessels
15. Cardiovascular system. Blood
16. Cardiovascular system. Heart activity. Blood circulation
17. Immunity
18. Hygiene and health related knowledge about the cardiovascular system
19. Locomotive system. Structure of bones and joints. Skull
20. Locomotive system. Vertebral column, chest and limbs
21. Locomotive system. Muscles
22. Reproductive system. Male reproductive system
23. Reproductive system. Female reproductive system
24. Fertilization. Embryonic and postnatal development
25. Nervous system. Spinal cord
26. Nervous system. Brain
27. Nervous system. Cerebrum
28. Nervous system. Autonomic nervous system
29. Endocrine system. Pituitary gland, epiphysis, thyroid gland, parathyroid glands
30. Endocrine system. Pancreas, adrenal glands, sex glands
31. Sensory systems. Visual sensory system
32. Sensory systems. Auditory, balance, taste, olfactory sensory systems, system of common sensitivity
33. Skin
34. Chemical composition of the cell
35. Carbohydrates and lipids
36. Proteins
37. Enzymes
38. Nucleic acids
39. Supramolecular complexes. Viruses.
40. Cell – the basic unit of the living matter
41. Prokaryotic cell
42. Eukaryotic cell
43. Cell membrane
44. Non-membrane bound and single-membrane bound organelles
45. Double-membrane bound organelles
46. Nucleus
47. Genetic processes. Replication
48. Realization of the genetic information. Transcription and translation
49. Cell division. Amitosis and mitosis
50. Cell division. Meiosis
51. Cell cycle

**Test – sample**

**Biology, Test 5, Variant 2**

**Name:** .....

**Group:** .....

I. Encircle the correct answer:

max. 8 points

1. Rhythmical heart contracts and relaxes are caused by:

- a) nerves coming from the brain
- b) central nervous system
- c) special cardiac muscle cells
- d) nerves coming from the spinal cord

2. Which of the following is NOT correct:

- a) after lymph nodes the lymph is rich of erythrocytes
- b) the lymph vessels flow into blood vessels
- c) before the lymph nodes the lymph is like the tissue fluid
- d) a part of the tissue fluid enters the lymph capillaries

3. During the ventricle contraction:

- a) atrioventricular valves are open
- b) semi-lunar valves are closed
- c) atrioventricular valves are closed
- d) atrioventricular and semi-lunar valves are open

4. Which of the following doesn't lead to hypotension:

- a) atherosclerosis
- b) lack of enough liquids in the body
- c) improper diet and bad nutrition
- d) genetic factors

5. The cardiac muscles are supplied with blood through:

- a) aorta
- b) pulmonary veins
- c) coronary arteries
- d) pulmonary arteries

6. Pulmonary circulation starts with

- a) left ventricle and aorta
- b) left atrium and pulmonary vein
- c) right ventricle and pulmonary artery
- d) right atrium and vena cava

7. After interaction between Ag and Ab the result is:

- a) clot
- b) coagulation
- c) agglutination
- d) thrombus

8. During the atrium contraction:

- a) atrioventricular valves are open
- b) semi-lunar valves are open
- c) atrioventricular and semi-lunar valves are closed
- d) atrioventricular and semi-lunar valves are open

II. Give brief answers for the following features of the heart: max. 11 points

- it has a size of a .....
- three layers of the heart wall ....., ....., .....
- protective sac .....
- valves between atria and ventricles ....., .....
- a blood vessel going out of the right ventricle .....
- a blood vessel entering the left atrium .....

III. Write 3 types of internal extracellular body fluids (liquids): max. 3 points

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IV. Write 3 types of blood vessels: max. 3 points

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V. Write 5 diseases of cardiovascular system: max. 5 points

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VI. Describe the blood groups B, AB and Rh-: max. 12 points

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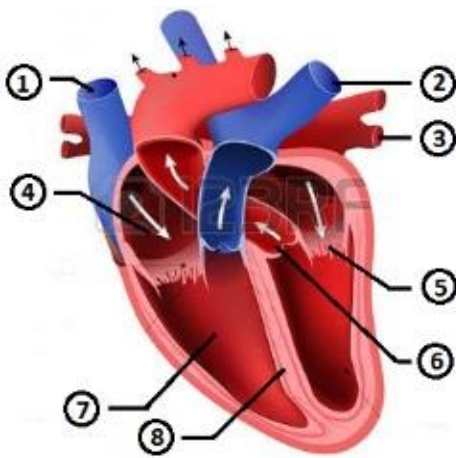
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VII. Read the text carefully and fill in the gaps: max. 10 points

..... (platelets) are produced in the ..... They play an important role in ..... This process is carried out when a blood vessel is ..... Then the platelets release a chemical. Due to this chemical, the soluble plasma protein called ..... turns into insoluble stringy protein ..... The stringy protein threads and erythrocytes form a ..... to cover the wound. .... (white blood cells) protect wounded area from infection. Unlike the erythrocytes they have a distinct ..... and can ..... like amoebae.

VIII. Write the parts of the heart shown on the drawing: max. 8 points



1. ....
2. ....
3. ....
4. ....
5. ....
6. ....
7. ....
8. ....