Федеральное государственное бюджетное образовательное учреждение высшего образования Первый Московский государственный медицинский университет имени И.М. Сеченова Министерства здравоохранения Российской Федерации

УТВЕРЖДАЮ

Председатель учебно-методического совета по

довузовскому образованию, д.ф.н.

_____ Краснюк И.И.

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Рабочая программа

по предмету «Биология на английском»

для профильных 10-11 классов средних общеобразовательных школ

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Working program
for the subject "Biology in English"
for 10-11 profile classes of secondary schools

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Moscow – 2016

Введение

Документ содержит рабочую программу по предмету биология на английском языке, который предназначен для учителей и преподавателей, работающих в медико-биологических классах комплекса «школа-вуз»при Первый МГМУ им. И.М.Сеченова.

Рабочая программа позволяет изучать последовательно все модули дисциплины или отдельно взятый модуль в качестве элективного курса. Рабочая программа содержит перечень рекомендуемых лекций, мониторингов и их распределение в учебном курсе.

Поурочные мониторинги усвоения материала проводятся учителями школ. Мониторинги усвоения материала по завершению изучения модуля проводят преподаватели Первого МГМУ им. И.М.Сеченова.

Рекомендуемые лекции читают преподаватели Первого МГМУ им. И.М.Сеченова.

Introduction

This manual contains methodical complex of biology and is created for teachers working in medico-biological classes of ‘school-university’ complex of I.M. Sechenov First Moscow State Medical University.

The working program allows studying consistently all modules of the discipline or a separate module in an elective course. The working program contains a list of recommended lectures, monitoring and their distribution in a training course.

Ongoing monitoring is conducted by school teachers. Monitoring of mastering the material after the completion of the module is conducted by the staff of I.M. Sechenov First Moscow State Medical University.

Recommended lectures are given by lecturers of I.M. Sechenov First Moscow State Medical University.

Working program 10th grade (170 hours)

Content	Subject of the lecture
Fundamentals of cytology (40 hours) 5 hours per week	

The rules of conduct and safety in biology class when performing laboratory and practical work. Definition of life. The main features of living organisms. Levels of organization of living matter. Subject, tasks and methods of cytology. *Cytology significance for medicine.* Methods for studying cells. The chemical composition of cells. The elemental composition. Water. Isotonic, hypotonic and hypertonic solutions. Tension cells. *Homeostasis cells, its importance for the normal functioning of the body.* Organic substance cells. Biopolymers. Lipids (fats and lipids), particularly their structures and functions. Carbohydrates. Carbohydrates function in the cell. Backup and structural polysaccharides. **Lab.** Working with a microscope. Deplazmolysis and plasmolysis in plant cells. **Lab.** Color change of the cut plants put in water containing a colorant. **Lab.** The splitting of hydrogen peroxide by enzymes contained in the leaf cells elodea. Cell - structural and functional unit of living matter. The history of the cell opening. The main provisions of the cell theory. The main structural components of eukaryotic cells: the cell membrane, cytoplasm and nucleus. Single-membrane organelles, their structure and function. The concept of compartment .Vacuolar system in a cell organelle structure	1.Cell - structural and functional unit of living matter. The main structural components of eukaryotic cells: the cell membrane, cytoplasm and nucleus. Organelles and inclusions. Single-membrane organelles. Vacuolar system. 2. Double-membrane organelles . Non-membrane organelles. Inclusions.Prokaryotic and eukaryotic cells. Structure and function of the nucleus.Chromosomes, their chemical composition and structure. Nucleic acids - non-recurrent biopolymers. DNA and RNA. 3. Metabolism. Plastic and energy exchanges. Plastic exchange. Protein biosynthesis. 4. Autotrophs and heterotrophs.Photosynthesis. The biological significance of photosynthesis. 5. Energy metabolism.Glycolysis. Fermentation.Cellul

Practical work: 1. The acquisition of the skill of reproduction of schemes of single-membrane **organelles** structure**;..** 2. The acquisition of the skill of finding a variety of organelles in the cell electron diffraction. Double-membrane organelles, their structure and function of organelles structure **Practical work:** 1. The acquisition of the skill of reproduction schemes of double-membrane **organelles** structure**;.** 2. The acquisition of the skill of finding a variety of organelles in the cell electron diffraction. Non-membrane organelles, their structure and function. . Inclusions of cell organelle structure **Practical work:** 1. The acquisition of the skill acquisition of the skill of reproduction of schemes of non-membrane **organelles** structure**;.** 2. The acquisition of the skill of finding a variety of organelles in the cell electron diffraction. The concept of organelles and inclusion. **Lab.** The main structural components of eukaryotic cells. **Lab.** Inclusions and their functions. The structural features of plant, animal and fungal cells. **Lab.** The structure of plant, animal and fungal cells under a microscope. **Lab.** Movement of chloroplasts in plant cells. Prokaryotic and eukaryotic cells.	ar respiration.

Features of the structure and prokaryotic cell activity. Acellular forms of life. Viruses and phages - intracellular parasites. Viral disease in humans, animals and plants. Structure and function of the nucleus. Chromosomes, their chemical composition and structure. The concept of a karyotype. Nucleic acids, their structure and function. Differences between DNA and RNA molecules. Characteristics of the DNA helix. DNA replication. Transcription. RNA types, their role in the cell. Gene. Structural genes. Genes pro- and eukaryotes. Splicing. DNA code. **Practice work.** The solution of situational problems in the construction of DNA, RNA and protein. Proteins. Primary and secondary structure of the protein. Tertiary and quaternary structure of the protein. Proteins function in the cell. Enzymes, their chemical composition and structure. Denaturation and renaturation of protein. Metabolism. Plastic and energy exchanges. Protein biosynthesis. The role of nucleic acids in the protein biosynthesis. Transcription. The activation process of tRNA. The role of enzymes in protein biosynthesis implementation. Translation. The role of ribosomal protein biosynthesis.	

Practice work. The solution of situational problems to build protein molecules on the basis of the DNA molecule. Autotrophs and heterotrophs. Photosynthesis. The biological significance of photosynthesis. The structure of the chloroplasts. Light and dark phases of photosynthesis. The light phase of photosynthesis. Role of enzymes, pigments and NADP +. The dark phase of photosynthesis. The relationship of light and dark phases of photosynthesis. The role of enzymes. Ways to improve the efficiency of the processes of photosynthesis in crop plants. Chemosynthesis. Energy metabolism. ATP, GTP, FAD. Energy bonds in ATP. The role of ATP in the cell activity. The main stages of energy metabolism. The preparatory phase, the role of the lysosomes in the process. Glycolysis, its energy efficiency. The role of enzymes and NAD + in glycolysis. Fermentation. Types of fermentation (lactic and alcoholic). The energy efficiency of fermentation processes. Cellular respiration. Oxidative cleavage of pyruvate. The main reactions and biological meaning of the Krebs cycle. Cellular respiration. Oxidative phosphorylation. The role of oxygen in the respiration. The energy efficiency of the processes of respiration.	

Intermediate monitoring. Cytology.	
Reproduction and development of organisms (20 hours) 5 hours per week	
Cell division - biological process that underlies reproduction and individual development of organisms.The concept of a karyotype. Haploid and diploid sets of chromosomes. Eu- and heterochromatin. The constancy of the amount of DNA in the nucleus. The mitotic cell cycle.Polytene chromosomes. Mitosis. The phases of mitosis. The biological significance of mitosis. Practical work. Solution of the problems involving division of mitosis. Amitosis. The biological significance of amitosis. Cytotoxic agents. Formation of polyploids. **Practical work**. Solution of the problems involving division of mitosis. Types of breeding organisms. Asexual and sexual reproduction. Types of asexual reproduction. Meiosis. The first division of meiosis. Interkinesis. The second meiotic division. The biological significance of meiosis. **Practical work.** Solving problems in the phase of meiosis. **Practical work.** Solving problems on the phases of mitosis and meiosis. Gametogenesis. Features of spermato - and oogenesis. Germ cells. **Practical work.** The solution of tasks on gametogenesis. Types of sexual reproduction.	1.Meiosis. The biological significance of meiosis. Gametogenesis - spermatogenesis and oogenesis. 2. Fertilization is the process of restoring the diploid set of chromosomes. Individual development of organisms (crushing, gastrulation, histo-and organogenesis).

Fertilization - the recovery process of the diploid number of chromosomes. Parthenogenesis. Double fertilization in flowering plants. Individual development of organisms. The periods of ontogeny. The development of a fertilized egg (in Amphioxus example). Splitting. Blastula. Gastrulation. Gastrula stage. Germ layers. Homology germ layers as evidence of the unity of origin of the animals. Formation of organ systems. Embryonic induction. Post-embryonic development. Direct and indirect development.	
Interim monitoring. Reproduction and development.	
Fundamentals of Genetics (30 hours)	

Genetics - the science of the laws of heredity and variation. Hybridological method of studying heredity.Basic concepts of genetics. Mendel's Laws. Monohybrid cross. The first law of Mendel. Practical lesson. Task solution. The second law of Mendel. Splitting in the second generation. Practical lesson. Task solution. The intermediate type of inheritance. Analyzing cross. The hypothesis of the "purity of gametes." Meiosis as a material basis for the "purity of gametes" hypothesis. Practical lesson. Task solution. Two-hybrid and polhybrid crossing. The third law of Mendel. The statistical nature of cleavage events.Lattice Penneta. Practical lesson. Task solution. Genotype as a holistic system of historically established. Interaction of alleles. Inheritance of blood groups and rhesus factor. Rhesus factor. Practical lesson. Task solution.. Interaction of non-allelic genes. Practical lesson. Task solution. The chromosomal theory of heredity of T.Morgana. The phenomenon of linked inheritance. Linkage group. Full linkage. Practical lesson. Task solution. Incomplete clutch. Crossover. Genetic maps of chromosomes.	1. Basic concepts of genetics. Mendel's laws. 2. The interaction of allelic and non-allelic genes. 3. The chromosomal theory of heredity of T.Morgana.Types of sex determination. Sex-linked inheritance. 4. Variability and its types. 5. Human Genetics.Methods of studying human heredity.

Practical lesson. Task solution. Methods of sex determination. Chromosomal sex determination. Sex chromosomes and autosomes. Types of sex determination. Sex-linked inheritance. Inheritance, limited by sex. Practical lesson. Task solution. Variability and its types. Modification variability. The rate of reaction. Statistical patterns of modification variability. Variation number and variation curve. Practical lesson. Task solution by the drawing a number of variations, variational curve. Genotypic variability: mutation and combinative. Recombinant chromosome. Mutagenic factors. Genomic mutation. The gene and chromosomal mutations. Human Genetics. Methods of studying human heredity. Plant selection. Selection of animals and microorganisms. Fundamentals of biotechnology. Cell engineering. Fundamentals of biotechnology. Genetic Engineering.	

Interim monitoring. Genetics	
Bacteria, fungi, lichens, plants (45 hours)	

Botany - the study of plants. General knowledge about plants and their taxonomy. Elementary concepts of systematic (taxonomic) categories. The plant - the entire organism. The general concept of vegetative and generative organs. Life forms of plants. Basic vital functions of the plant organism. Turgor. Movement of plants. Features of the structure of the plant cell. **Lab.** The main components of the plant cell. **Lab.** The movement of chloroplasts in plant cells. **Lab.**Plasmolysis of the plant cell. **Lab.** Inclusion in a plant cell. Tissues of plant organs in connection with the functions performed in the whole organism (the covering, basic and formational). Tissues of plant organs in connection with the functions performed in the whole organism (conductive and mechanical). Green algae. General characteristics. Systematics. Single-celled algae (chlamydomonas, chlorella, pleurococcus). The filamentous algae. The structure and characteristics of life. Asexual and sexual reproduction of algae.Distribution of algae. **Lab.** Algae. Brown and red algae. Examples of seaweed. The value of algae in nature and economy. **Lab.** Laminaria. The structure, reproduction and life conditions of the bacteria. Significance of bacteria	1. Plant Systematics. The plant cell. Tissues of plant organs in connection with the functions performed in the whole organism 2. Algae . General characteristics. Systematics. Significance for humans. 3. Mushrooms and lichens.Features of the structure and functioning. The role for nature and human life. 4. Spread of moss and ferns.Features of the structure.The alternation of generations. Significance for humans. 5. Gymnosperms. The structure, reproduction and development cycle on the example of pine. 6. Angiosperms. Flower. Double fertilization in flowering plants and its mechanism. The formation of the seed and fruit. 7. Vegetative plant organs. 8. Dicotyledonous class and the Monocots class. Features of classes

for human life. Kingdom Fungi. Real fungi. General characteristics. Systematics. The reasons for the ambiguity of the systematics of fungi and their comparison with the plants and animals. The lower and higher fungi. Moulds. Yeast. The structure, reproduction, especially life. Mushrooms parasites. The structure, nutrition, reproduction. Pileate mushrooms. Lichens. Department spread Moss plants. Green moss. The structure, reproduction and development cycle of flax Kukushkin. Concepts sporophyte and gametophyte. Sphagnum moss. Waterlogging. Peat formation, its significance. Order lycopsids. General characteristics. Lycopodium clavatum. The structure, reproduction, development cycle. Significance of lycopsids plants. Order Horsetail plant. General characteristics. Horsetail. The structure, reproduction, development cycle. Significance of Horsetail. Order of Ferny plants. General characteristics. Bracken fern. The structure, reproduction and development cycle. Fossil fern and coal formation. Significance of fern plants in nature and human life. Order of gymnosperms. Distribution and biology of conifers. Significance for nature and the economy. Angiosperms (flowering plants). Main aromorphoses angiosperms. Flower.	and the main features of the families.

The inflorescences and their biological significance. Pollination. Double fertilization. The formation of the seed and fruit. Seed. Functions of seeds. The structure of the seed. Composition of seed. Terms of seed germination. Seed germination. Sowing time and depth of seeding. Respiration of seeds. Nutrition and growth of seedlings. Elevated and underground germination. **Lab.** Detection of reserve substances in wheat seed. **Lab.** Germination of wheat seeds and beans. Fetus. Methods for propagation of seeds and fruits in nature. Root. Root functions. Types of roots. Types of root systems. Root zones. Root cap. The structure of root fibril.Root growth in length and width. The anatomical structure of the root of monocots in the suction zone. Root uptake of water and mineral salts. The mineral salts needed for a plant. The anatomical structure of roots of dicotyledonous plants in the zone o carriage. Modifications of roots, their structure, biological and economic importance. The phenomenon of parasitism among plants. Significance of tillage, fertilization, irrigation, cultivation of crops for life. The shoot. Variety shoots. Runaway growth in length and width. The gusset growth. Bud , its structure and location on the stem. The development of shoot from bud. Branching shoot. Stem. Stem functions. The anatomical structure of a woody stem dicot. The increase in thickness of the stem.The formation of growth rings. Seasonal variations in the	

timber. Age of trees. The movement of mineral and organic substances on the stalk. Modified shoots: underground (rhizome, stolon, tuber, bulb) and aboveground (stolons tuber, tendril, thorn), their structure, biological and economic importance. Vegetative reproduction of plants. Leaf. Functions of leaf. The external structure of the composite leaf. Leaf fall. Leaf. Functions of leaf. The external structure of the composite leaf. Leaf fall. Features of the internal structure of the leaf in connection with its functions. Class Dicots. General characteristics. Cruciferous. The Rosaceae family. The Legume family. The Solanaceae family The Asteraceae family. Class Monocots. General characteristics. The family of Liliaceae. Class Monocots. General characteristics. The family of Cereals.	

Interim monitoring. Botany.	
Evolution (35 hours)	

General characteristics of the pre-Darwinian biology period. Dominance in the science of metaphysical notions of the immutability of nature and "primal feasibility". Works of Carl Linnaeus on the taxonomy of plants and animals and their importance. The teaching of Lamarck on the evolution of nature and its significance. The first Russian evolutionists. Visiting Darwin Museum. Historical preconditions of Charles Darwin's theory. Works of Charles Darwin. The main provisions of the Charles Darwin theory of evolution. Significance for teaching natural sciences. The driving force of evolution. Heredity. Variability, variability of species. Natural selection. The leading role of natural selection in evolution. The struggle for existence, its forms. Artificial selection and genetic variation - the basis of selection of domestic animals and varieties of cultivated plants. Common and different between artificial and natural selection. STE. The adaptive nature of evolution. Relative expediency. The divergent nature of evolution.Convergence. Microevolution. The population as a basic unit of evolution. The concept of the ecological and genetic characteristics of the populations. Elementary factors of evolution. Natural selection - the guiding factor in evolution. The forms of natural selection. The	1. General characteristics of the period of pre-Darwinian biology in **works of Carl Linnaeus. The teaching of Lamarck.** 2. STE. Microevolution.The population as a basic unit of evolution.Elementary factors of evolution. Speciation. Species. 3. Macroevolution. 4. The division of the earth's history into eras and periods. The development of the organic world in the Archean, Proterozoic and Paleozoic era. 5. The division of the earth's history into eras and periods. The development of the organic world in the Mesozoic and Cenozoic era. 6. Human origin.

creative role of natural selection. Speciation - the result of microevolution. Ways of speciation. Species. Criteria of species. The structure of the species. Macroevolution. The emergence of supra-species taxa. Forms phylogeny. The concept of the speed of evolution. The relationship between micro - and macroevolution. The main directions of evolution. Biological progress or biological regression. Ways to achieve biological progress. The extinction of species. The concept of levels of evolutionary change. Results of evolution: organic expediency, fitness of organisms, species diversity. The system of plants and animals - display of evolution. Principles of modern classification of organisms. Key evidence of organic evolution: a paleontological and biogeographical regions. The main evidence of organic evolution: comparative anatomy, embryology. A comparative study of the structure of modern plants and animals for proof of their historical development. Homology and analogy. Rudiments and atavism in the structure of modern organisms as proof of evolution. The similarity of the embryonic development of organisms as proof of the unity of their origin. Biogenetic law the Müller - Haeckel. The emergence of life on Earth. Hypothesis of the origin of life. Geological and chemical evolution (abiogenesis). Biogenesis.	

The main directions of evolution - the development of the organic world. The division of the earth's history into eras and periods. The development of the organic world in the Archean, Proterozoic and Paleozoic era. The appearance of plants and animals - the divergence in the organic world by the process of nutrition. Space the role of green plants. Single-celled. Multicellular. The emergence of plants onto land in the Paleozoic era. Psilophytes. Mosses. The causes of the blossoming fern. The appearance of gymnosperms. The emergence of animal onto land. The appearance of vertebrates by improving the organization of devices of wide importance and expansion of the habitat. Crossopterygii as the ancestors of amphibians. The emergence and flourishing of ancient amphibians. Stegocephalia - "prefabricated" form. The development of the organic world in the Mesozoic era. The dominance of the gymnosperms. The emergence and spread of the angiosperms. The heyday of reptiles. The emergence of birds and mammals. The appearance of bony fishes. The reasons for the extinction of the gymnosperms and reptiles in the Mesozoic era. The development of the organic world in the Cenozoic era. The dominance of angiosperms, insects, birds and mammals. The emergence in the evolution of multiple devices to a variety of habitats. The hypothesis of human origins. The unity of the origin of the human races. Unscientific, reactionary nature of "social Darwinism" and racism. The role of biological and social factors in human evolution.	

Final exam for entrance in the 11th grade.

Рабочая программа for 11th grade (170 hours)

Content	Subject of lectures
Animals (40 hours)	

The classification of animals. The concept of a kingdom, phylum, class. order, class and species. The significance and success of modern zoology. Similarities and differences between plants and animals. Subkingdom Protozoa. General characteristics of the kingdom. Systematics. Type Sarcomastigophora. Class Rhizopod. Marine Sarcodina. Dysentery amoeba. Class flagellates. Evolutionary significance of euglenophytes and volvoxes. Parasitic flagellates. Type of ciliates. Type of Spore. Parasitic ciliates and Sporozoa. The general concept of the infection ways, changing owners, life forms, the infective stage, the cycles of parasitic ciliates and Sporozoa. Ways of eliminating malaria as a mass disease. Subkingdom multicellular. Type of cloth. General characteristics of the type. Type Coelenterates animals. Sea hydroid phase change in the life cycle. Class Scyphozoa. Class coral polyps. Type of flat worms. General characteristics of the type. Systematics. Flukes Class. General characteristics of the class. Adaptations to parasitism. Protection from infection. Change ща the hosts in the development cycle. Class Tapeworms. General characteristics of the class. Cycles of development and change of	1. Parasitic Sarcomastigophora 2. Ciliates and Spore. 3. Type Coelenterates animals. 4. Flat worms - parasites of man. 5. Round worms - parasites of man. 6. Type Annelida. Main aromorphoses arthropods. 7. Class Arachnids. The medical value of the class. 8. A variety of insects and their importance.

owners. Protection from infection. Tapeworms - human parasites. Type Roundworms. General characteristics of the type. Ascaris. Reproduction and development of the roundworm. Prevention measures against infection. Round worms - human parasites. Protection from infection. Type Annelida. General characteristics of the type. Systematics. Class Polychaetes. Nereid and lobworm.Evolutionary significance of polychaete worms. Class Oligochaeta. General characteristics of the class. The class of leeches. Features of the structure. The medical importance of leeches. Type of Shellfish. General characteristics of the type. Systematics. Class Gastropods. The class of Bivalves. General characteristics of the class. Meaning of gastropods and bivalves. The class Cephalopods. Features of the structure. Meaning for humans. Type of Arthropods. General characteristics of the type. Systematics. The similarities and differences between arthropods and annelids. Aromorphoses arthropods. Class Crustaceans animals. General characteristics of the class. A variety of crustaceans animals. The medical importance. Class Arachnids animals. General characteristics of the class. Poisonous spider. Pincers. The role of pincers in nature and their medical value. Human protection measures against ticks. The class of insects. General characteristics of the class.	

A variety of insects and their importance. The principal Order of the insects. Order of insects with incomplete metamorphosis. Order Orthoptera. Representatives. Locusts as a dangerous pest of agriculture. Order of insects with incomplete metamorphosis. Order Hemiptera (bugs). Representatives. Significance. Protective coloration. Order of insects with incomplete metamorphosis. Cockroaches squad. Representatives. Significance. Order of insects with incomplete metamorphosis. Lice Squad. Representatives. Significance. Order endopterygota. The Lepidoptera. Representatives. Significance. Order endopterygota. Order Coleoptera. Harmful and beneficial bugs. Warns coloring. Order endopterygota. Order Diptera. Order endopterygota. Order Hymenoptera. Riders as representatives of parasitic Hymenoptera. Biological method of combating harmful insects. Protection of beneficial insects.	

Interim monitoring. Zoology of invertebrates	
Animals (35 hours)	

Type Chordates. General characteristics of the type. Systematics. Class Amphioxus. The similarity of Amphioxus with invertebrates and vertebrates. Vertebrates subtype. Superclass Pisces. General characteristics. Reproduction and development of fish. Fertility. The development of fish migration. Class Cartilaginous fish: The class of Bony fish. Bone and cartilaginous fish (Sturgeon). Representatives, structure, significance. Bony fish: Clupeiformes, Salmoniformes, Carps, Catfishes, Gadiformes, . Pleuronectiformes. Spawning conditions. Lungfish. Crossopterygii fish. Amphibians class. General characteristics of the class. Systematics. The diversity of amphibians and their meaning. The origin of amphibians. Class of Reptiles. General characteristics of the class. Systematics. Adaptations to life in the terrestrial environment. Snakes: snakes, vipers. Appearance. Differences from viper snake. Poisonous glands, fangs and venom viper. The action of snake venom. First aid for snakebite. Modern reptiles: turtles, crocodiles. Variety of ancient reptiles. The origin of reptiles. Class Birds. General characteristics of the class. The fitness of the birds to fly.	1. Type Chordates. General characteristics of the type. Fish. A systematic review of the superclass of fish. 2. Class Amphibians Systematics. General characteristics of the class. 3. Class Reptiles. Systematics.General characteristics of the class. 4. Class Birds. General characteristics of the class. 5. Class Mammals. Systematics.General characteristics of the class. 6. Higher primates. 7.Apes.

Reproduction and development of birds. The origin of birds. Perioptic. Real birds. Ostrich (ratites) birds. Features of the structure and functioning. Penguins. Features of the structure and living. Flying (Keel) birds. Lifestyle, adaptability to different conditions of existence.Nutrition, reproduction and development. Seasonal events in the life of birds: flights, nesting. Environmental order of birds. The role of birds in nature and their significance in human life. Bird flu. Class Mammals. General characteristics of the class. Systematics. Features external and internal structure of mammals. Reproduction and development. The origin of mammals. The diversity of mammals and their meaning. Oviparous. Platypus and echidna. Similarities and egg-laying reptiles. The diversity of mammals and their meaning. Marsupial mammals. These beasts. Placental mammals - the most progressive group of modern vertebrates. Their diversity. Order: Pitcher, Bats. Features of the structure and living. Order: Rodents, Lagomorphs. Features of the structure and living. Order: Carnivorous. Features of the structure and living. Order: Pinnipeds, Cetaceans. Features of the structure and living. Order: Artiodactyla, Perissodactyla. Features of the structure and living. Order: Primates. Features of the structure and living.	

Great apes. Families of Old World monkeys and Apes. Apes and humans.	

Interim monitoring. Zoology of vertebrates	
Human (60 hours)	

Human sciences: anatomy, physiology, hygiene, medicine, psychology. Tissue, tissue types and their properties. Organs, organ systems. The structure and processes of the human organism. Neuro-humoral regulation of the processes of vital activity. Structure and function of the nervous system. Nervous tissue. Divisions of the nervous system: central and peripheral. Spinal cord, its structure and function. Reflex nature of the activity of the nervous system. The reflex arc. Brain structure and functions. The somatic and autonomic nervous system. The vegetative (autonomic) nervous system, particularly its structure and functioning of the stress and its development phases: alarm, adaptation exhaustion. Preventing the negative effects of stress. Disorders of the nervous system activity and their prevention. Practical work. Experience (joint activity of sympathetic and parasympathetic systems), the experience (the cerebellum). The endocrine system. Gland of external, internal and mixed secretion. Secrets and hormones. Hormones. Target organs. Concept about Hypo - and hyperfunction of endocrine glands. The hormones of the pituitary, pineal gland, thyroid, parathyroid and thymus glands. Hormones of the pancreas, adrenal glands and gonads. Regulation of the activities of the glands. The interaction of the nervous and humoral regulation. An overview of the digestive system. Digestive enzymes. Changes of food in different parts of the alimentary canal. Experiments of Pavlov on studying digestion.	1. Divisions of the nervous system. Brain and spinal cord. 2. Somatic and vegetative (autonomic) nervous systems.Departments of the autonomic nervous system. 3. The glands of internal secretion, their structure and function. 4. Overview of the digestive system. Digestive enzymes. Changing food in different parts of the alimentary canal. 5. Breath.Structure and function of the respiratory system. Breathing Stages. 6. Vitamins. Hygienic conditions of normal digestion. 7. Blood. Functions of blood.Composition of blood: plasma, formed elements.

Interim monitoring. Anatomy	
Ecology (35 hours)	

Ecology Ecology Problems. Habitat. Environmental factors. The laws of functioning of environmental factors. Stenobiont. The combined effects of factors on the body. Eurybionts. The combined effects of factors on the body. Major climatic factors. Shine. The effect of light on the body. Major climatic factors. Temperature. The effect of temperature on body. Major climatic factors. Humidity. The effect of humidity on the body. Limiting factors. Biological rhythms. Condition of winter dormancy (suspended animation). Cold-resistance. Factors that control the seasonal development. Photoperiodism. The ecological characteristics of species. The ecological characteristics. The ecological niche. Population structure: sex, age, spatial and behavioral. The growth of the population. Survival curves. Regulation of population size. The ecological niche. Community or biocenosis (phytocoenosis, zoocenoses, microbiocenosis). Biotope (ecotope). A variety of communities. Concepts of biogeocoenosis. Special, spatial and trophic structure biogeocoenose.	1. Ecology - the science of the laws governing the relationships of organisms with the environment. 2. Community or biocenosis biotope (ecotope). 3. Concepts biogeocoenosis. 4. The concepts of the ecosystem. 5. Biosphere - a global ecosystem. Teachings V.I. Vernadsky on the biosphere. 6. The evolution of the biosphere. Global human-induced changes in the biosphere. Protection of Nature.Noosphere.

The concepts of the ecosystem. Special, spatial and trophic structure of the ecosystem. The components of the ecosystem (producers, consuments, destructors). Chains and food networks. Types of food chains. Terms of the ecological pyramid. Self-regulation in biogeocoenose. Changing of ecosystems (succession). Climax community. Agro-ecosystems. Biosphere - a global ecosystem. Teachings VI Vernadsky on the biosphere. The boundaries of the biosphere. The components of the biosphere (living, biogenic, bone, biokostnoe, radioactive substances and cosmogenic scattered atoms). The functions of living matter (gas, concentration, redox, biochemical and biogeochemical). Biomass. The biological cycle. Biogenic migration of atoms (for example, carbon cycle and nitrogen). The evolution of the biosphere. Global anthropogenic changes in the biosphere (the population explosion). Global anthropogenic changes in the biosphere (the use of natural resources, habitat modification, pollution). The Nature Conservancy (protected natural territories and objects of nature monuments, zoos). The Nature Conservancy (international organizations and programs, environmental	

monitoring, MAC rules). Noosphere.	

The final examination of 11th grade	

Approximate timetable for the monitoring.

10 class
Cytology (testing, colloquium)I.M. SECHENOV FIRST MOSCOW STATE MEDICAL UNIVERSITY
Reproduction and development (testing, colloquium)I.M. SECHENOV FIRST MOSCOW STATE MEDICAL UNIVERSITY
Genetics (testing, colloquium)I.M. SECHENOV FIRST MOSCOW STATE MEDICAL UNIVERSITY
Botany (testing, colloquium)I.M. SECHENOV FIRST MOSCOW STATE MEDICAL UNIVERSITY
Transfer exam (testing, colloquium) Chair of biology and general genetics I.M. SECHENOV FIRST MOSCOW STATE MEDICAL UNIVERSITY
11 class
Zoology of invertebrates (testing, colloquium)I.M. SECHENOV FIRST MOSCOW STATE MEDICAL UNIVERSITY
Zoology of vertebrates (testing, colloquium)I.M. SECHENOV FIRST MOSCOW STATE MEDICAL UNIVERSITY
Human Anatomy and Physiology (testing, colloquium)I.M. SECHENOV FIRST MOSCOW STATE MEDICAL UNIVERSITY

Final exam (testing, colloquium)I.M. SECHENOV FIRST MOSCOW STATE MEDICAL UNIVERSITY

Approximate list of lectures.

10 class
The theme of the lecture
Cell-structural and functional unit of life. The main structural components of eukaryotic cells: cellular shell, cytoplasm and nucleus. Organelles and inclusions. Single-membrane organelles Vacuolar system.
Double-membrane organelles Non-membrane organelles Inclusions. Prokaryotic and eukaryotic cells.
Structure and functions of the nucleus. Chromosomes, their chemical composition and structure. Nucleic acids-non-recurrent biopolymers. DNA and RNA.
Metabolism. Plastic and energy exchanges. Plastic exchange. Protein biosynthesis.
Autotrophs and heterotrophs. Photosynthesis. Biological significance of photosynthesis.
Энергетический обмен. Glycolysis. Fermentation. Cellular respiration.
Мейоз. Biological significance of meiosis. Gametogenesis – spermatogenesis and oogenesis.
Fertilization-the process of restoring the diploid set of chromosomes. Individual development of organisms (splitting,

gastrulation, histo-and organogenesis).
The basic concepts of genetics. Mendel's Laws.
The interaction between allelic and nonallelic genes.
Chromosome theory of heredity t. Morgan. Types of sex determination. Sex-linked inheritance.
Variability and its form.
Human genetics. Methods of studying human heredity.
Plant Taxonomy. Plant cell. The tissue of plants in connection with the functions performed in the whole organism.
Algae. General characteristics. Systematics. Significance to humans.
Fungi and lichens. Features of structure and functioning. Role in nature and human life.
Mossy plants and Ferns. Features of the structure. Alternation of generations. Significance to humans.
Gymnosperms. Structure, reproduction and development cycle on the example of pine.
Angiosperms plants. The flower. Double fertilization in flowering plants and its mechanism. The formation of the seed and the fruit.
Plant vegetative organs.
Dicotyledonous and Monocotyledonous class of plants. Characteristics of classes and the main features of the families.

General characteristics of the pre-Darwinian biology period. Works of Carl Linnaeus. The Teachings Of G. B. Lamarca.
СТЭ. Microevolution. Population as the basic unit of evolution. Basic factors of evolution. Speciation. Species
Macroevolution.
Division of the history of the Earth and periods. The development of the organic world in Archean, Proterozoic and Paleozoic era.
Division of the history of the Earth and periods. The development of the organic world in the Mesozoic and Cenozoic era.
The origin of man.
11 class
The theme of the lecture
Parasitic Sarcomastigophora.
Ciliates and Sporozoa.
Coelenterata type animals.
Flat worms- human parasites.
Roundworms – human parasites.
Annelid worms. Main aromorphoses of arthropods.

Class Arachnida. Medical importance of class.
Diversity of insects and their importance.
Type Chordates. General characteristics of the type. The Fish. A systematic review of the superclass of fish.
Class Amphibian Systematics. General characteristics of the class.
Classes Of Reptiles. Systematics. General characteristics of the class.
Class Birds. General characteristics of the class.
The Class Of Mammals. Systematics. General characteristics of the class.
Higher primates. Anthropoid ape
Parts of the nervous system. Spinal cord and brain.
Somatic and vegetative (autonomic) nervous system. Departments of the autonomic nervous system.
Endocrine glands, their structure and function.
Overview of the digestive system. Digestive enzymes. Change of food in different parts of the alimentary canal.
Respiration. Structure and function of the respiratory system. Stages of respiration.
Vitamins. Hygienic conditions of normal digestion.

Blood. Functions of blood. Blood composition: plasma, shaped elements.
Immunity and its types.
Heart, its structure and work. The mechanism of the movement of blood through the vessels.
Organs of the urinary system. Skin. Functions of the skin. The structure of the skin. Derivatives of the skin.
Higher nervous activity (HNA). The I. M. Sechenov role in the development of the doctrine of HNA. The teachings of I.p. Pavlov on conditional reflexes.
Teaching of I. P. Pavlov on analyzers.
Eye, its structure and function. Hygiene of organ of vision.
Ecology - the science about the regularities of relationships of organisms with the environment.
Community or biocoenosis. Biotope (ecotope).
The concept of biogeocenoz.
The concept of the ecosystem.
The biosphere - the global ecosystem. The Teachings Of The V.I. Vernadsky about biosphere.
The evolution of the biosphere. Global anthropogenic changes in the biosphere. Protection of nature. Noosphere.