THE OPTIONAL SUBJECT: BIOLOGY

NUMBER OF LESSONS PER WEEK: 4 lessons

THE AIM OF THE SUBJECT: extending of knowledge of the topics stated in the content bellow. It is suitable for students with a genuine interest in biology, future graduates from biology and students whose entrance examinations to a university require knowledge of biology.

CONTENT OF THE SUBJECT:

1. Biology as a science

Biology and its position in the system of natural sciences. Mutual relationships of biology and other sciences. The overview of basic biological disciplines. The short overview of history of biology. The methods of scientific work in biology. Importance of biological knowledge for life and practical use.

2. Biology of cells and the shared features of living organisms

The basic differences between living and non-living systems. The basic levels of organisations of living systems. The noncellular form of organisation of living matter. The information. The regulation. The basic forms of regulation of living systems.

Autoreproduction of living systems. Ontogenesis and phylogenesis of living systems. The cell theory. The common features of cells. The chemical composition of cells. The cell structure. The types of cells. Reproduction of a cell and the cell cycle. Diferentiation and specialisation of cells. The cell´s transport tasks. Transport of energy in cells.

3. Non-cellular and prokaryotic organisms

The basic characteristics, phylogenetic relationships, the structure, the way of living, the importance of viruses, bacteria and archeons.

4. Biology of plants

4.1 The structure of a plant body

The plant tissues. The plant tissue classification. The structure and the function of particular tissues. The plant organs. The classification of plant organs. The structure and function of particular organs.

4.2 Plant physiology.

Metabolism of plants and energy. Plant nutrition. Chemosynthesis, photosynthesis. Plant respiration. Mineral nutrition. The dynamic plant – taking in and retaining of water. Reproduction of plants. Metagenesis – alternation of sexual and asexual generation in ontogenesis of plants. Growth and development of plants.

5. Taxonomy and phylogeny of plants

The systems of taxonomy. Taxonomic ranks. The short overview of the natural system of plants. The basis of phylogeny. Algae. The lower vascular plants. The flowering plants. Dicotyledon and monocotyledon plants.

6. Fungi and lichens

The basic characteristics, nutrition, symbiosis, basic taxonomic ranks – the classes of the division True fungi and representative species, importance.

7. Biology of animals

7.1 The organ systems and their functions.

The body organisation of protozoans and multicellular animals. Organ systems – formation, classification, basic characteristics, phylogeny, structure, function, importance: integumentary, skeletal, muscular, digestive system – metabolism, thermoregulation. The gas exchanging system – water and terrestrial animals, the process of respiration, the importance of oxygen in metabolic processes. The circulatory system – transport of nutrients, types of body liquids, the blood, blood groups, the lymph, the tissue liquid, circulatory systems, the heart activity. The excretory system – excretion – the urine, its formation and composition referring to the environment, osmoregulation. The regulatory systems – the regulatory mechanisms – the endocrine, nervous systems, the immune system – the immune mechanisms, the immunity. The sensory organs. The reproductive system – reproduction, the process of fertilization, the embryonal and postembryonal development. Formation of the bilateral symmetry, protostomia – deuterostomia (the development of chorda)

7.2 Animal behaviour – etology.

The innate behaviour – the instinct, the key stimulus, biorhythms. The acquired behaviour – obligatory and facultative learning. Functional patterns of behaviour.

8. The taxonomy and phylogeny of animals

The basic characteristics of the animal kingdom. Taxonomic features, taxonomic ranks. Terms – individual, species, population. The animal taxonomy – basic characteristics of phyla of animals, their position in the animal kingdom, the body structure, the way of living, importance. Unicellular organisms – flagellates, sarcodines, . apicomplexa, ciliates. Multicellular organisms. Invertebrates – sponges, cnidarians, acnidarians, flatworms, roundworms, molluscs, annelids, arthropods. Deuterostomia – echinoderms, chordates. The overview of historical development of animals.

9. Biology of humans

The human organism from the point of morphology and function. The skeletal and muscular system. Body liquids. The heart and the circulatory system. The gas exchange system. The digestive system and nutrition. The excretory system. The skin. Regulatory systems – the nervous and the endocrine systems. Receptors and senses. The immune system. Reproduction and ontogenesis of humans. The man and healthy lifestyle.

10. Genetics

Genetics – the science about inheritance and variation of organisms. Basic genetic terms. The molecular basics of genetics – the genetic information, the genetic code, gene expression. The genetics of a cell. Nuclear and extranuclear inheritance. The inheritance of a multinuclear organism. Mendel´s rules of inheritance. The inheritance with dominance. The intermediate inheritance. The gonosome inheritance. Genetic variation. Mutagens. Mutations and their importance. The human genetics. The inheritance of traits. Inherited predispositions. Inherited developmental disorders. Genetic diseases. The genetic consulting. The genetics of population.

11. Ecology

Ecology as a science. The subject of study. The environment of organisms. Factors of environment. Organisms and their environment. Environmental requirements of organisms. Populations. Communities. The main types of plant communities in Slovakia. The ecosystem. The relationships and importance of plants and animals in systems of nature. Mutual relationships of living organisms. Thy dynamic ecosystem – energy flow, matter flow, food chains (producents, consumers, reducents), productivity of ecosystem. The development of ecosystem – stability, succession, biodiversity. Protection of nature – causes, effects, consequences of damaging of natural stability of ecosystem. The ways of protection of nature. The passive and active protection of nature. The territorial protection of nature. Prevention – legal, ethical aspects of protection of nature. Endangered and protected species of animals.

THE RECOMMENDED SOURCES OF LITERATURE:

1. PICKERING, W.R.: Complete Biology. Oxford, Oxford University press 2000
2. UŠÁKOVÁ, K. a kol.: Biológia pre gymnázia 1 – Biológia bunky a rastlín. Bratislava, SPN 1999
3. UŠÁKOVÁ, K. a kol.: Biológia pre gymnázia 2 – Vývoj, systém a ekológia rastlín . Bratislava, SPN 2000
4. UŠÁKOVÁ, K. a kol.: Biológia pre gymnázia 3 – Biológia a etológia živočíchov. Bratislava, SPN 2001
5. UŠÁKOVÁ, K. a kol.: Biológia pre gymnázia 4 – Vývoj, systém a ekológia živočíchov. Bratislava, SPN 2002
6. UŠÁKOVÁ, K. a kol.: Biológia pre gymnázia 5 – Genetika. Bratislava, SPN 2003
7. UŠÁKOVÁ, K. a kol.: Biológia pre gymnázia 6 – Biológia človeka, evolúcia a vznik života na Zemi. Bratislava, SPN 2005
8. HORNÍK, F. a kol.: Seminár a cvičenia z biológie pre 4.ročník gymnázia. Bratislava, SPN 1987