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Biology

Lower Secondary level

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EDUCATION TECHNOLOGIES

Biology

Lower Secondary level

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Structure of the male reproductive system

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Stages of embryonal development

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Health and diseases

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Pathogenic factors, types of disease (infectious, genetic and neoplastic diseases)

The concept of immunity

Functions of the immune system (passive and active immunity)

Cellular and humoral immunity (the concepts of antigen and antibody)

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3.30. Vaccinations

Epidemics – causes and effects, mechanisms of development, prevention and control

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3.32 Viral diseases (basic symptoms, modes of transmission, prevention)

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Definition of antiseptics

The actions of antibiotics and their significance in medicine

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3.36. Effects of drugs, alcohol and cigarettes on the organism

Types of drugs (painkillers, stimulants, hallucinogens, sedatives)
 Effects of drugs on the organism – drug addiction
 Effects of alcohol on the organism – alcoholism
 Effects of smoking on human health

Chapter Four

Life processes in plants

Plant nutrition

4.1 Photosynthesis

The reaction of photosynthesis (substrates, products), the role of chlorophyll in photosynthesis
 Light-dependent and light-independent reactions of photosynthesis
 Site of photosynthesis, leaf structure as an adaptation for photosynthesis
 Conditions for photosynthesis (light, temperature, carbon dioxide, water)
 Photosynthesis and respiration
 The significance of photosynthesis

4.2 Mineral nutrition in plants

Macro-elements
 Trace elements
 Ultra-trace elements
 Importance of nitrogen, phosphorus, potassium, sulphur, calcium and magnesium for optimum plant growth
 Inorganic fertilizers

4.3 Food production

Influence of soil pH on plant growth
 Hydroponic cultivation
 Greenhouses
 Soil fertilization (types of fertilizers)
 Herbicides
 Plant diseases and methods for their control

4.4 Carnivorous plants

The significance of carnivorousness of plants
 Characteristics of carnivorous plants (e.g. round-leaved sundew, Venus flytrap, pitcher plant)

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4.5 Plant reproduction

Alternation of generations in non-flowering plants:
 - non-flowering plants with a dominant gametophyte
 - on-flowering plants with a dominant sporophyte
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 - angiosperms

4.6 Seed germination and plant growth

Structure and chemical composition of seeds
 Process of germination
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Transport in plants and plant movements

4.7 Water transport in plants

Structure of xylem, its location and functions (support and transport)
 Intake of mineral salts by roots (diffusion, active transport)
 Mechanisms of water transport in plants:
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 - tension force of leaves (transpiration, cohesion, adhesion)
 Types of transpiration (stomatal and cuticular)
 Factors affecting transpiration (temperature, humidity, air movements)
 Water balance in plants (turgor)

4.8 Transport and accumulation of organic substances in plants

Structure of phloem, its location and transport functions
 Transport of products of photosynthesis
 Accumulation of products of photosynthesis by plants (types of nutrients, storage organs in plants)

4.9 Responsiveness and movement in plants

Tropisms: phototropism, geotropism, hydrotropism, thigmotropism
 Role of auxins
 Application of auxins
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Chapter Five

Variation, heredity and evolution

Variation of organisms

5.1. Variation of organisms

Inherited and acquired traits
 Genetic variation
 Environmental variation
 Continuous and discontinuous variation

5.2 Reproduction and variation

Clones as organisms created by processes of asexual reproduction
 Sexual reproduction as a source of genetic variation: recombination

5.3 Mutations as a source of variation in organisms

The concept of mutation as a change in genetic material
 Mutations in somatic cells (neoplasms)
 Mutations in reproductive cells (new traits)
 Spontaneous mutations and mutations brought about by mutagens

Heredity

5.4. Heredity according to Mendel

Mendel – the discoverer of the principles of heredity

- Basic terms in genetics (gene, allele, phenotype, genotype, homozygote, heterozygote, dominant trait, recessive trait)
- Arranging the genetic mosaic
- Mendel's Laws
- 5.5 The principles of sex inheritance in humans
 - Male and female karyotypes
 - Sex chromosomes in male and female gametes
 - Possible combinations of sex chromosomes in a zygote (genetic mosaic)
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- 5.5. The chromosomal theory of inheritance
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 - Linked genes
 - Crossing-over
 - Chromosome maps
- 5.6 Genetic diseases
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 - Family tree
- 5.7 Inheritance of blood groups in humans
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 - Principles of blood group inheritance
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 - Genetic code
 - Protein synthesis
- 5.10 Mutations as changes in DNA
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 - Molecular effects of mutations – sickle cell disease as the first molecular disease to be discovered

Evolution

- 5.11 Theories on the origin of life on Earth
 - Creationism
 - Evolutionism
 - Evidence for the common origin and evolutionary development of living organisms from: paleontology, comparative anatomy and physiology, embryology and genetics
- 5.12 Charles Darwin and the theory of evolution
 - Charles Darwin
 - The essentials of Darwin's theory of evolution: over-production, variation, struggle for existence, natural selection (survival of the fittest)
- 5.13 The formation of species – speciation

- Explanation that evolution precedes at a population level
- Evolutionary forces: inherited variation (mutations), natural selection (stabilizing selection, directional selection and disruptive selection), isolation (e.g. geographic and reproductive), random events (genetic drift)
- Extinction of species
- Allopatric and sympatric speciation
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Chapter Six Biotechnology and genetic engineering

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 - Food spoilage as a result of bacterial growth – Louis Pasteur's experiment
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- 6.3 Biotechnology past and present
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 - Production of enzymes for washing powders

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- 6.5 Genetic engineering and its applications in biotechnology
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- Medical applications of genetic engineering (production of insulin, somatotrophin, erythropoietin)
- 6.6 Other applications of genetic engineering
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 - Genetic „fingerprints“
 - Human Genome Project
- 6.7 Genetic modifications of organisms
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- 7.4 Life on land
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 - Adaptation of reptiles to life on land (comparison of reptilian and amphibian features)
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- 7.6 Adaptations of organisms to the environment
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 - coping with water shortage: cactus – lungfish – camel
 - movement through water (birds' wings): grebe – cormorant – razorbill – penguin

- seeing in the dark (eyes): owl – bat – blind cave tetra (fish)
- 7.7 Different modes of feeding in mammals
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