German International Abitur*
Biology Curriculum

*Diploma from German secondary school qualifying for university admission

Semester	Content
11 **1st semester**	**Cells and metabolism** • Structure and function of organelles • Structure and function of proteins, lipids und carbohydrates • Composition and function of biomembranes • Plasmolysis / deplasmolysis • Diffusion und osmosis, osmotic equation • Transport through biomembranes **Enzymes** • Structure and function of enzymes • Specificity of substrate and reaction • Factors that affect the rate of enzyme activity • Enzyme inhibition **Metabolism** • Digestive system • Circulation and respiration • Endocrine system • Cell respiration: glycolysis, citric acid cycle, respiratory chain, oxidative phosporylation • Cell respiration in balance • Fermentation without oxygen: alcoholic fermentation, lactic acid fermentation • Photosynthesis: light action spectrum, composition and function of photosystems, light-dependent and light-independent reactions • Limiting factors of photosynthesis (light, temperature, carbon dioxide) • Importance of photosynthesis for life on earth **Ecology** • Dynamics of ecosystems • Food chains • Energy flow through ecosystems • Man and the environment • Population ecology • Ecological niches

	• Abiotic and biotic factors • Ecological potency
Semester	**Content**
12 **1st semester**	**Molecular Genetics:** • Nucleus structure, chromosome structure • Mitosis -meiosis • Inter-und intrachromosomal Recombination • DNA structure • Replication , Meselson and Stahl experiment • One-Gene-one-polypeptide-hypothesis • Protein biosynthesis: transcription, translation, genetic code • Gene mutations: missense mutation, nonsense mutation • Protein biosynthesis in prokaryotes und eukaroytes • Operon model • Modern methods in Genetics: genetic fingerprinting, genetic scissors, gene therapy, transgenic plants and bacteria, transgenic animals **Human Genetics:** • Mendel's laws of heredity • Inheritance of diseases, genealogical analysis • Inheritance of blood groups **Immunbiology:** • Peripheral defense, unspecific defense, specific defense • Lymphatic system • Origin of white blood cells • Antibody production • Immunological memory • Antigene – antibody-reaction • Allergies, transplantation/transfusions, autoimmune diseases

Semester	Content
12 **2nd semester**	**Neurobiology** • Structure of a neuron • Resting potential, action potential, propagation of an action potential in myelinated and nonmyelinated axons • Synapse structure and function, synaptic integration, neorotransmitter molecules • Sensory receptors, especially sense of vision • Neural connections • Structure and function of the central and vegetative nervous system • Structure and function of the spinal cord • Functions if cerebrum, cerebellum and brain stem • Muscle contraction • Effects of neurotoxins, drug abuse and medication on the nervous system **Evolution** • Origin of life • Evolutionary evidence: homology/analogy, “missing link”, atavism, rudimentary organs • Theories of evolution: Lamarck and Darwin • Evolution factors: mutation, recombination, variability; the effect of selection on a gene pool (abiotic and biotic selective pressures) isolation (geographical, ecological, genetic and reproductive isolation); • Interaction of various evolution factors, genetic drift • Co-evolution • Human evolution: humans as primats, distinctive features of humans (locomotion, skeletal structure, use of the hand, skull and dentition, intelligence, social behaviour and language) • Evolution of humans: early hominids, genus Homo • The origin of present-day humans • Chemical and biological evolution • Endosymbiotic hypothesis: eukaryotes develop