TOPICS FOR THE ADMISSION INTERVIEW

NCU COLLEGIUM MEDICUM IN BYDGOSZCZ

General questions

- Motivation, interest, career choice. Why did you choose this study programme?
- Tell us about yourself, experience, interests etc.
- Why this medical school? What do you know about this school?
- Your strengths and attributes, how you handle stress, main weaknesses
- Concerns about studying the selected study programme
- Knowledge of the medical profession, other professions allied to medicine. Recent developments.
- What medical publications do you read?

Biology

1. The structure function and examples of main molecules (carbohydrates, proteins, nucleic acids and lipids). The importance of water for organisms, based on its physico-chemical properties.
2. The characteristic features of the protein enzyme structure and the course of enzymatic catalysis. The examples of different ways to regulate enzyme activity in a cell. The general principles of metabolism. The substrates and products of major catabolic pathways (photosynthesis, aerobic respiratory stages, anaerobic respiration, glycolysis).
3. Similarities and differences in structure and function between Prokaryotic and Eukaryotic cells. Cell surface structures. Motility. Internal organization. Membrane. Compartmentalization. Cytoskeleton. Endomembrane system: endoplasmic reticulum, Golgi Apparatus and lysosomes, nucleus, ribosomes, mitochondria. The course of plasmolysis in plant cells, referring to the phenomenon of osmosis.
4. Cell cycle. Mitosis and meiosis. Cellular organization of genetic material. Phases of cell cycle. Cellular organization of genetic material. The stages of mitosis and meiosis. A comparison of mitosis and meiosis.
5. Viruses. Structure of viruses. General features of viral replication cycles.

6. The importance of arthropods in nature and human life. The characteristics of fish, amphibians, reptiles, birds and mammals in connection with the environment and lifestyle.
7. Chromosomal and molecular basis of inheritance. The chromosomal basis of sex. Inheritance of X- and Y-linked genes. Alternation of chromosome number and structure. Human disorders due to chromosomal alternation. Inheritance of organelle genes. The examples of inheriting according to Mendel's laws. DNA as genetic material. Structural model of DNA. Chromosomes' structure.
8. Genetic mechanisms. The flow of genetic information. Replication: Transcription (alternation of mRNA ends, RNA splicing). Translation. Genetic code. Type of mutations. Regulation of gene expression (promoters, transcription factors). Tools to control gene expression.
9. Tissues and body membranes. Structure and physiology of connective, muscle, epithelial and nervous tissue; serous, mucous, synovial and cutaneous membranes.
10. Nervous system. Organization of nervous system. The central nervous system. The organization of human brain. Peripheral nervous system: motor and autonomic nervous system. Neurons, synapses and signalling. Neurons structure and function. Resting and action potential. Conduction of action potentials. Examples of neurotransmitters.
11. Hormones and endocrine system. Intercellular communication. Endocrine tissues and organs. Chemical classes of hormones. Multiple effects of hormones. Simple hormone pathways. Feedback regulation.
12. Immune system. Innate and adaptive immunity. Antigen. Antibody. The humoral immune response. The cell-mediated immune response. Inflammatory response. Immunological memory. Allergies.
13. Cardiovascular system. Organization of human circulatory system. Heart and heart's rhythmic beat. Structure of the heart. Blood vessels structure and function. Blood pressure. Blood composition and function.
14. Respiratory system. Organization of human respiratory system. Function and basic structure of haemoglobin and myoglobin.
15. Musculoskeletal system. Organization and function of human skeletal and muscular system, general structure of bones. Classification of junctions and joints. Classification of skeleton.
16. Visual and auditory sensory systems. Visual apparatus. Eyeball, accessory visual apparatus. Optic nerve. Nerves of extraocular muscles (III, IV, VI). Pupillary light reflex and accommodation re action

17. Auditory and vestibular apparatuses. External, middle and internal ear. Vestibulocochlear nerve. Sound pathway
18. Organization of human digestive system. Chemical digestion in the human digestive system. Examples and location of digestive enzymes. The correct glucose levels. What information cholesterol measurement provides us. Role of water in maintaining health.
19. Human reproduction and development. Gametogenesis. Conception.
20. The basic elements of the organism's ecological niche. The trophic levels of producers and consumers of organic matter, and among the latter - herbivores, predators and destructors. The similarities and differences between different interspecies relationships (like competition, predation, herbivorousness and parasitism).
21. The basic sources of knowledge about the mechanisms and course of evolution – i.e. divergent and convergent evolution, homologous and analogous structures.

Chemistry

Inorganic chemistry

1. Modern atomic theory. Elements and atomic number. Isotopes and atomic weight.
2. The Periodic Table. Symbols of elements. The periodic table and some characteristics of different groups. Electronic structure of atoms and electron configurations. Electron configurations and the periodic table.
3. Molecular compounds. Covalent bonds and the periodic table. Multiple covalent bonds and coordinate covalent bonds. Characteristics of molecular compounds. Molecular formulas and Lewis structures. Polar covalent bonds and electronegativity, polar molecules. Naming binary molecular compounds.
4. Classification and balancing of chemical reactions. Classes of chemical reactions. Chemical equations and balancing chemical equations. Acids, bases, and neutralization reactions. Redox reactions.
5. Mole and mass relationships. The mole and Avogadro’s number.
6. Reaction rates and chemical equilibria. Endothermic and exothermic chemical reactions. Factors that influence chemical reaction rates.
7. Physical quantities. Metric system of units. Metric units of length, mass, volume
8. Fundamental chemical laws. Law of conservation of mass, definite proportions, multiple proportions.
9. Mole concept and chemical formulas. Calculations involving chemical equations. Calculations involving volume and concentration.

10. Acids and bases in aqueous solution, some common acids and bases, the Brønsted–Lowry definition of acids and bases, acid dissociation constants, acid and base strength.
11. Buffers measuring acidity in aqueous solution: pH. Buffer solutions. Titration.

Organic chemistry

1. Alkanes. The nature of organic molecules. The structure of organic molecules: alkanes and their isomers, Drawing organic structures. Naming alkanes, cycloalkanes.
2. Alkenes and Alkynes. Naming alkenes and alkynes. The structure of alkenes, cis–trans isomerism.
3. Aromatic compounds and the structure of benzene. Naming aromatic compounds.
4. Alcohols - some common alcohols Naming alcohols. Phenols- some common phenols.
5. Carboxylic acids and their derivatives properties and names. Some common carboxylic acids.
6. Amino acids structures. Chemical properties of proteins.
7. Enzymes and vitamins. Catalysis by enzymes. How enzymes work. Some of vitamins and minerals.
8. Nucleic acids and protein synthesis DNA, chromosomes, and genes. Composition of nucleic acids. The structure of nucleic acid chains. Base pairing in DNA: the Watson–Crick model.

Physics

1. Scalar and vector physical quantities, SI system of units.
2. Velocity and acceleration. Uniform motion and uniformly accelerated motion.
3. Force, mass and weight. Newton's laws of motion.
4. Work, kinetic energy, potential energy, power. Energy transformations. Conservation of energy.
5. Temperature, heat and internal energy. Thermal equilibrium, calorimetry. Specific heat and latent heat. First law of thermodynamics.
6. Pressure. Pascal’s principle, Archimedes' principle, buoyant force.
7. Electrostatics. Electric charge, electric field, field lines. Coulomb’s law.
8. Electric current, voltage. Ohm’s law, electric resistance. Resistors in series and parallel.
9. Magnets and magnetic fields. Magnetic induction. Current as a source of magnetic field.
10. Mechanical and electromagnetic waves; wavelength, period, frequency, speed of wave. Electromagnetic spectrum.

11. Geometric optics. Law of reflection and refraction. Index of refraction. Images in mirrors and lenses, focal point, focal length, optical power, lens equation.
12. Atomic nucleus. Natural radioactivity: alpha, beta and gamma decay. The radioactive decay law; the radioactive half-life.
13. Photon theory of light, photon energy. Atomic spectra, energy levels, transitions, absorption and emission.