

**PROGRAM IN CHEMISTRY
FOR INTERVIEW WITH ENTRANTS
TO THE FACULTY FOR INTERNATIONAL STUDENTS**

MAIN DEFINITIONS AND LAWS OF CHEMISTRY

The atomic and molecular theory. Atoms. Molecules. Atomic and molar masses. Mole as a unit of the amount of substances. Chemical elements, chemical compounds. Symbols of chemical elements and chemical formulas. Valence. Calculating an element's mass fraction in a chemical compound according to its formula. The law of mass conservation. Chemical equations. Avogadro's law. Molar volume of gases.

STRUCTURE OF MATTER

Periodic law and periodic system of chemical elements. Structure of periodic system. The relationship between the properties of chemical elements and their position in the periodic system.

Structure of atomic nuclei and electron shells of the elements in the I–IV periods. Isotopes. Types of chemical bonding: covalent bond (polar and non-polar), ionic, metallic and hydrogen bonding. The examples of chemical compounds with different types of chemical bonding. Covalence and oxidation numbers.

THE MAIN CLASSES OF INORGANIC COMPOUNDS

Oxides: their classification and nomenclature. Physical and chemical properties of oxides. Preparing of oxides.

Bases and their classification. Nomenclature of bases. Chemical properties of bases. Methods of bases preparing. Alkali.

Acids and their classification. Nomenclature of acids. Chemical properties of acids. Methods of acids preparing.

Salts. Salts' classification and nomenclature. Chemical properties of salts. Methods of salts preparing.

SOLUTIONS. ELECTROLYTIC DISSOCIATION

Solutions. Solubility. The affect of nature, temperature and pressure on the solubility of substances. Concentration units: percent by mass, molarity.

The theory of electrolytic dissociation. Ionization percent. Weak and strong electrolytes. Ionic equations of chemical reactions. Properties of acids, bases and salts from the point of view of the theory of electrolytic dissociation. Salts' hydrolysis.

ORGANIC CHEMISTRY

The Butlerov's theory of organic compounds chemical structure. The affect

of chemical structure on the properties of organic compounds. Isomers. Classification of organic compounds.

Saturated hydrocarbons (alkanes and cycloalkanes). Homologous series of alkanes, their electronic structure (sp^3 -hybridization). Nomenclature and properties of alkanes. Sources of alkanes.

Alkenes. Structure of alkenes: sp^2 -hybridization, sigma- and pi-bonds. Nomenclature and properties of alkenes. Preparing of alkenes. The concept of the polymers. Polymerization reactions.

Alkynes. Structure of alkynes (sp -hybridization). Chemical properties of alkynes.

Aromatic hydrocarbons. Benzene: electronic structure and chemical properties. Homologues of benzene.

Alcohols. Classification and nomenclature of alcohols. Physical and chemical properties of alcohols. Methanol and ethanol (their application). Ethylene glycol and glycerol. The difference in properties of mono- and polyhydric alcohols.

Aldehydes: structure of molecules and chemical properties. Preparing and application of formaldehyde and acetaldehyde.

Carboxylic acids: Electronic structure of the carboxyl group. Physical and chemical properties of carboxylic acids. The main representatives of monocarboxylic acids: formic acid (its specific properties), acetic, stearic and oleic acids.

Esters, their structure, nomenclature and chemical properties. Esterification. Lipids, their physical and chemical properties.

Carbohydrates: mono- and polysaccharides.

Amino acids and proteins.

BIOLOGY

Test questions for foreign applicants Gomel State Medical University.

1. Biology as a science about living things. Fundamental properties of life.
2. Cell is an elementary genetic, structural and functional biological unit of life. The cell theory and the basic stages of its development. Contemporary statements of the cell theory. Organic and inorganic substances of a cell.
3. Structure of DNA molecule. Chargaff rules. Replication of DNA.
4. Structure of RNA and its types. RNA synthesis.
5. Structure of ATP molecule and its significance.
6. Features of structure of prokaryotic cells.
7. The structural elements of eukaryotic cells: cell membrane, cytoplasm, and nucleus. Its structure and function. Membrane transport (active and passive). Endocytosis and exocytosis.
8. Main organelles of the cell, its structure and function: endoplasmic reticulum, ribosomes, Golgi apparatus, lysosomes, centrosome, mitochondria.
9. Structure of metaphase chromosome. Chromosome types.

10. Coding of genetic information in the cell. Genetic code and its properties.
11. Substance flow in a cell. Assimilation and dissimilation. Photosynthesis, chemosynthesis, protein synthesis. Autotrophic and heterotrophic, aerobic and anaerobic organisms.
12. Direct division of the cell – amitosis.
13. Indirect division of the cell - mitosis. Phases of mitosis and its characteristics.
14. Meiosis and its biology significance.
15. Rules of monogenic inheritance of traits. Concept of dominance and its cytology bases.
16. Principle of segregation and its cytology bases. Batson's thesis of "gametes purity".
17. Principle of independent assortment and its cytology bases.
18. Allele interaction: dominance, incomplete dominance, overdominance, codominance.
19. Gene interaction: epistasis, complementation, polymery.
20. Base points of the chromosome theory of inheritance. Chromosomes as gene linkage groups. Genetic maps.
21. Sex as a biology trait. Chromosome sex determination. Inheritance of sex-linked traits.
22. Methods of human genetics: the pedigree analysis, twins' method, cytogenetic and biochemical methods.
23. Variability, its types and kinds. Characteristics of phenotypic diversity. Norm of reaction. Genotypic diversity: combinative and mutational. Classification and characteristics of mutations.
24. Gene and chromosomal human hereditary diseases.
25. Characteristics of unicellular organisms. Kingdom Protista and characteristics of the key representatives of the kingdom: common ameba, dysentery ameba, euglena, infusoria, plasmodium, balantidium.
26. Phylum Flat worms, Class Flukes. Structure and life cycle of large liver fluke.
27. Phylum Flat worms, Class Tapeworms. Structure and life cycle of beef tapeworm.
28. Phylum Roundworms. Structure and life cycle of large intestinal roundworm, pinworm, and whipworm.
29. Characteristics of phylum Arthropods, class Arachnids on the example of common house spider. Dog tick and itch mite as representatives of the class Arachnids.
30. Phylum Arthropods, class Insects, significance of representatives of the class. Insects as parasites of human and animals, and as transmitters of disease excitors.
31. Characteristics of phylum Chordates. Structure of lancelet.
32. Phylum Chordates, class Fishes. Peculiarity of structure and vital functions of fishes, their significance.
33. Phylum Chordates, class Amphibians. Peculiarity of structure, vital functions and development of amphibians, their significance.

34. Phylum Chordates, class Reptiles. Peculiarity of structure, vital functions and development of reptiles, their significance.
35. Phylum Chordates, class Mammalians. Peculiarity of structure, vital functions and development of mammalians, their significance.
36. Anatomy, physiology, and hygiene as the sciences. Conceptions of organs and organ systems.
37. Structure of human skeleton. Structure, joint, and growth of bones. Muscular system.
38. Internal environment of human organism. Blood as a component of internal environment of human organism, its function.
39. Circulatory system. Structure of heart and heart work. Structure of blood vessels. Circles of blood circulation.
40. Respiratory system. Structure and function of respiratory organs.
41. Digestive system. Structure and function of digestive organs. Enzymes and their role in digestion.
42. Excretory system. Structure and function of kidney.
43. Structure and function of skin. Skin appendages.
44. Endocrine system. Glands of endocrine system and its hormones.
45. Nervous system. Divisions of nervous system. Neuron structure. Structure and function of brain. Structure and function of spinal cord. Reflex.
46. Sense organs. Sight analyzer. Hearing analyzer. Taste and smell analyzers.
47. Types of organism's reproduction. Asexual reproduction.
48. Sexual reproduction. Sex cells formation and structure.
49. Fertilization.
50. Ontogenesis. Embryo development and postnatal ontogenesis in animals. Peculiarities of human ontogenesis.