Questions for the final control

1. Bioorganic chemistry as a science: definition, purposes and objectives, sections, research methods. The importance in higher medical education.
2. Classification of organic compounds by structure carbon skeleton and nature of functional groups.
3. The structure of the major classes of bioorganic compounds according to the nature functional groups: alcohols, phenols, thiols, aldehydes, ketones, carboxylic acids, esters, amides, nitro compounds, amines.
4. Nomenclature of organic compounds: trivial, rational, international. Principles of formation of organic compound names of by IUPAC nomenclature: substituent and radical functional.
5. The nature of chemical bonds in organic compounds: hybridization of orbitals, electronic structure of carbon compounds.
6. The spatial structure of bioorganic compounds: stereochemical formulas, configuration and conformation. Stereoisomers: geometrical, optical, rotary (conformers).Optical isomerism, chirality of molecules of organic compounds. D/L- and R/S-stereochemical nomenclature. Enantiomers and diastereoisomers of bioorganic compounds. Relationships between spatial structure and physiological activity of bioorganic compounds.
7. Types of reactions in bioorganic chemistry: classification according to the obtained product (direction) and the reaction mechanism. Examples.
8. Carbonyl compounds in bioorganic chemistry. Chemical properties and biomedical significance of aldehydes and ketones.
9. Carboxylic acids in bioorganic chemistry, their structures and chemical properties. Functional derivatives of carboxylic acids: anhydrides, amides, esters. Decarboxylation reactions.Structure and properties of dicarboxylic acids: oxalic, malonic, succinic, glutaric, fumaric and maleic acids.
10. Lipids, their definition and classification. Fatty acids: palmitic, stearic, oleic, linoleic, linolenic, arachidonic. Simple lipids. Triacylglycerols (neutral fats): structure, physiological significance, hydrolysis.
11. Complex lipids. Phospholipids: phosphatidic acid, phosphatidyl ethanolamine, phosphatidyl choline, phosphatidyl serine. Sphingolipids and glycolipids. The role of complex lipids in the structure of biological membranes.
12. Amines, their nomenclature, and properties. Biomedical significance of biogenic amines (adrenaline, noradrenalin, dopamine, tryptamine, serotonin, histamine) and polyamines (putrescin, cadaverine).
13. Amino alcohols: structure, properties. Biomedical importance of ethanolamine (colamine), choline, acetyl choline.
14. Hydroxyacids in bioorganic chemistry. Structure and properties of mono-carboxylic (lactic and β-hydroxybutyric acids), and dicarboxylic (malic, tartaric) hydroxyacids.
15. Amino acids: structure, stereoisomerism, chemical properties. Biomedical importance of L-α-amino acids. Reactions of biochemical transformations of amino acids: deamination, transamination, and decarboxylation.
16. Amino acid composition of proteins and peptides, classification of natural L-α-amino acids. Chemical and physicochemical properties of proteinogenic amino acids. Ninhydrin test and its significance in the analysis of amino acids.
17. Proteins and peptides: definition, classification and biological functions. Types of bonds between amino acid residues in protein molecules. Peptide bond: formation, structure, biuret reaction.
18. Levels of structural organization of proteins: primary, secondary, tertiary and quaternary structure. Oligomeric proteins.Physical and chemical properties of proteins and their molecular weight. Methods of protein deposition. Denaturation of proteins.
19. Carbohydrates: definition, classification. Monosaccharides: aldoses and ketoses; trioses, tetroses, pentoses, hexoses, heptoses), biomedical significance of some representatives.
20. Monosaccharides: pentoses (ribose, 2-deoxyribose, xylose), hexoses (glucose, galactose, mannose, fructose), their structure and properties. Qualitative reactions of glucose.

21. Structure and properties of monosaccharide derivatives. Amino substituted derivatives: glucosamine, galactosamine. Uronic acid. L-Ascorbic acid (vitamin C). Products of monosaccharide reductions: sorbitol, mannitol.

22. Oligosaccharide: structure, properties. Disaccharides: sucrose, lactose, maltose, their biomedical significance.

23. Polysaccharides. Homopolysaccharides: starch, glycogen, cellulose, dextrins, their structure, hydrolysis, and biomedical significance. Qualitative reaction for starch.Heteropolysaccharides: definition and structure. Structure and biomedical significance of glycosaminoglycans (mucopolysaccharides), hyaluronic acid, chondroitin sulfate, and heparin.

24. Five-membered heterocycles with one heteroatom: pyrrole, furan, thiophene. Biomedical importance of tetrapyrrole compounds like porphins, porphyrins, and heme.Indole and its derivatives, tryptophan and reaction of formation of tryptamine and serotonin. Indoxyl, skatol, skatoxyl and their formation in the process of protein putrefaction in the intestinal tract.

25. Five-membered heterocycles with two nitrogen atoms. Pyrazole, pyrazolone, and pyrazolone-5 derivatives as drugs: antipyrin, amidopyrinum, analgin. Imidazole and its derivatives: histidine, histamine.

26. Five-membered heterocycles with two different heteroatoms: thiazole, oxazole. Thiazole as a structural component of molecule of thiamine (vitamin B_1).

27. Six-membered heterocycles with a nitrogen atom: pyridine. Nicotinamide (vitamin PP) as fragment of the redox pyridine dinucleotide coenzymes. Pyridoxine and molecular forms of vitamin B_6.

28. Six-membered heterocycles with two nitrogen atoms. Diazines: pyrimidine, pyrazine, pyridazine. Nitrogen bases, which are pyrimidine derivatives: uracil, cytosine, thymine.

29. Pyrimidine derivatives as drugs: 5-fluorouracil, potassium orotate. Barbituric acid, and barbiturates phenobarbital, veronal as sedatives and anti epileptic agents.

30. Purine and its derivatives. Amino derivatives of purines: adenine, guanine, their tautomeric forms, biochemical importance in the formation of nucleotides and coenzymes.Hydroxy substituted derivatives of purines: hypoxanthine, xanthine, and uric acid. Methylated xanthine derivatives, caffeine, theophylline, theobromine as physiologically active compounds with effect on the central nervous and cardiovascular systems.

31. Nucleosides and nucleotides. Nitrogen bases of purine and pyrimidine rows, comprising natural nucleotides. Minor nitrogen bases.

32. Nucleosides. Nucleotides as phosphorylated derivatives of nucleosides: nucleoside mono-, di- and triphosphates. Nomenclature of nucleosides and nucleotides as components of RNA and DNA.Structure and biochemical functions of free nucleotides: nucleotides, which are coenzymes, and cyclic nucleotides 3',5'-cAMP and 3',5'-cGMP.

33. Nucleic acids, desoxyribonucleic and ribonucleic acids as polynucleotides. Polarity of polynucleotide chains of DNA and RNA.Structure and properties of DNA, nucleotide composition, complementarity of bases. Primary, secondary and tertiary structure of DNA.RNA, its structure, types of RNA and their role in the biosynthesis of proteins.

34. Chemical nature of enzymes. Composition of simple and complex enzymes. Cofactors and coenzymes. Role of coenzymes and apoenzyme in catalysis.

35. Cofactors and coenzymes. Structures and properties. Vitamins as precursors of coenzymes. Examples.

36. Isozymes. Biologic role. Diagnostic importance of isozyme determination.

37. The mechanism of enzyme action. The kinetic of enzymatic catalysis. Dependence of the rate of reaction from concentration of substrate. The kinetic of enzymatic reaction: dependence of the rate of reaction from concentration of enzyme, pH and temperature.

38. The types of activation and inhibition of enzymes. Phosphorylation and dephosphorylation of enzymes. Active site of enzymes. Inhibitors and activators of the enzymes. Competitive and non-competitive inhibition. Medical application of enzyme inhibitors.

39. Allosteric regulation of enzymatic activity. Regulatory enzymes. Feedback regulation of their activity. Covalent modification of enzymes. Cyclic nucleotides (c-AMP, c-GMP) as the regulators of enzyme catalysis and biological functions of cells. Action of the regulation of protein kinases.

40. Enzymotherapy. Principles of diagnostic and treatment. Enzyme diagnostic and enzymotherapy in medicine.
41. General characteristics of energy metabolism. Metabolism: catabolism, anabolism and amphibolic pathways.General and specific pathways of catabolism. Stages of intercellular catabolism of biomolecules: proteins, carbohydrates, lipids.
42. The Citric Acid Cycle (CAC). Location in the cell. Enzymes of CAC. Importance of CAC.Bioenergetics of Citric Acid Cycle. Physiologic importance of CAC.
43. Reactions of biologic oxidation. Types of reactions: dehydrogenase, oxidase, oxygenase reactions and their biologic importance. Tissue respiration.Chemical nature of dehydrogenases. Role of coenzymes in the functions of enzymes.Flavoenzymes. Chemical nature and biochemical role.Cytochromes. Cytochrome oxidase, its chemical nature, the biochemical role and mechanism of participation in the respiratory chain.
44. Synthesis of ATP from ADP. Oxidative phosphorylation, which is coupling with respiratory chain. Index P/O.The chemiosmotic theory of oxidative phosphorylation. ATP synthase of mitochondria.Mechanism of transport of reducing equivalents through the membrane of mitochondria. Shuttle mechanism.
45. Microsomal oxidation. Cytochrome P450 and molecular organization of the electron transport chain.
46. Aerobic and anaerobic oxidation of glucose, natural characteristics of processes
47. Anaerobic oxidation of carbohydrates. Glycolysis.Oxidative-reduction steps of anaerobic glycolysis, its importance. Shuttle mechanism for the transfer of reducing equivalents of NADH.
48. Aerobic oxidation of glucose. The sequence of reactions and enzymes of glycolysis.Oxidative decarboxylation of pyruvate.
49. The comparison of bioenergetics of aerobic and anaerobic oxidation of glucose and glycogen. Pasteur's effect.
50. Pentose phosphate pathway of carbohydrates metabolism. Oxidative and non-oxidative phases. Biological importance of specialities of functioning in various tissues.Biosynthesis and catabolism of glycogen in the liver.
51. Mechanism of reciprocal regulation of glycogenolysis and glucogenesis by cAMP dependent cascade phosphorylation of enzymes. The role of adrenaline, glucagon and insulin in the hormonal regulation of glycogen exchange in muscules and liver.
52. Genetic disorders of glycogen metabolism (glycogenosis, aglycogenosis).
53. Gluconeogenesis. Mechanism in the different tissues and organs. Corey’s cycle and the glucose alanine cycle.
54. Blood glucose (glucosemia): normoglycemia, hypo- hyperglycemia, glucosuria. Blood diabetes is a pathology of glucose metabolism. Hormonal regulation of blood glucose concentration and exchange.
55. Pentose phosphate pathway of glucose oxidation: scheme of the process and biological significance. Metabolic pathways for the transformation of fructose and galactose; recessionary enzymopathies and their metabolism.
56. Catabolism of triacylglycerols in adipocytes of adipose tissue: sequence of reactions, mechanisms of regulation of triglyceride lipase activity. Neurohumoral regulation of lipolysis with the participation of adrenaline, norepinephrine, glucagon and insulin).
57. Reactions of oxidation of fatty acids (b-oxidation); the role of carnitine in the transport of fatty acids in mitochondria. Energetic activity of the oxidation of fatty acids in cells. Glycerol oxidation: enzymatic reactions, bioenergetics.
58. Ketone bodies. The reactions of biosynthesis and utilization of ketone bodies are of physiological significance. Disruption of the exchange of ketone bodies due to pathology (diabetes of the blood, fasting).
59. Biosynthesis of essential fatty acids: reactions in the biosynthesis of essential fatty acids (palmite) and regulation of the process. Biosynthesis of mono- polyunsaturated fatty acids in the human body. Biosynthesis of triacylglycerols and phosphoglycerates. Metabolism of sphingolipids. Genetic abnormalities in the metabolism of sphingolipids - sphingolipidoses.

60. Cholesterol biosynthesis: reaction scheme, regulation of cholesterol synthesis. Ways of biotransformation of cholesterol: esterification; the release of urinary acids, steroid hormones, vitamin D3. Pathologies of lipid metabolism: atherosclerosis, obesity, blood diabetes.

61. Circulatory transport and deposition of lipids in adipose tissue. Lipoprotein lipase in endothelium. Blood plasma lipoproteins: lipid and protein (apoprotein) storage. Hyper-lipoproteinemia.

62. The pool of the amino acids in the body. Routes for transport and utilization of amino acids in tissues. Research on the metabolism of carbon skeletons of amino acids in the human body. Glucogenic and ketogenic amino acids.

63. Direct and indirect deamination of high-grade L-amino acids in tissues. Transamination of amino acids: reactions and their biochemical significance, mechanisms of aminotransferases. Decarboxylation of L-amino acids in the human body. Physiological significance of the creation of products. Oxidation of biogenic amines.

64. Ways of creation and release of ammonia in the body. Biosynthesis of meat: sequence of enzyme reactions in biosynthesis, genetic abnormalities of enzymes in the fruit cycle.

65. Biosynthesis and biological role of creatine and creatine phosphate. Glutathione: natural, biosynthesis and biological functions of glutathione.

66. Specialized routes to the metabolism of cyclic amino acids - phenylalanine and tyrosine. Decreased enzyme metabolism of cyclic amino acids - phenylalanine and tyrosine. Exchange of cyclic amino acid tryptophan and its spasmopathic enzyme.

67. Nitrogen bases, nucleosides and nucleotides as the composite components of the nucleic acids. Minor nitrogen bases and nucleotides.Free nucleotides: ATP, NAD+, NADP+, FAD, FMN, CTP, UTP, 3′,5′-cAMP, 3′,5′-cGMP, their biochemical functions.

68. Nucleic acids. General characteristics of DNA and RNA, their biological importance in the storage and the transfer of genetic information.Features of DNA and RNA primary structure. Chemical bonds, which are responsible for the formation of nucleic acids primary structure.Secondary structure of DNA, role of hydrogen bonds in its formation (Chargaff′s rules, Watson-Crick model), anti-parallelity of strands.Tertiary structure of DNA. Physical and chemical properties of DNA, interaction with cation ligands, formation of nucleosomes.

69. Molecular organization of nuclear chromatin of eukaryotes; nucleosome organization, histone and non-histone proteins. Nucleoproteins: structure, biological functions.

70. Structure, properties and biological functions of RNA. Types of RNA: m-RNA, t-RNA, r-RNA. Features of the different type of RNA structural organization.

71. Biosynthesis of purine nucleotides; scheme of IMP synthesis reactions.Formation of AMP and GMP from IMP, mechanisms of regulation. Catabolism of purine nucleotides, hereditary disturbances of the uric acid metabolism.

72. Biosynthesis of pyrimidine nucleotides; scheme of reactions, regulation of synthesis.Biosynthesis of deoxyribonucleotides. Formation of the thymidine nucleotides. Inhibitors of TMP synthesis as anti-cancer medicines. Scheme of the pyrimidine nucleotide catabolism.

73. Replication of DNA, its biological importance, and semiconservative mechanism of replication.Sequence of the steps and DNA replication enzymes in prokaryotes and eukaryotes.

74. RNA transcription: prokaryotes and eukaryotes RNA-polymerases, signals of transcription: promoter, initiator and terminator fragments of genome.Processing and post-translational modification of synthesized RNA.

75. Genetic (biologic) code, triplet structure and properties.Transport RNA and transportation of amino acids. Amino acyl-tRNA-synthetases.Steps and mechanism of translation (protein synthesis) in ribosomes: initiation, elongation and termination.

76. Post-translational modification of peptide chains. Regulation of translation.Inhibitors of transcription and translation in prokaryotes and eukaryotes. Antibiotics and interferons, they use in medicine. Diphtheria toxin.

77. Regulation of prokaryote gene expression: regulatory and structural fragments of lactose, Lac-operon, gene regulator, promoter, operator.

78. Gene engineering: construction of recombinant DNA, gene cloning. Genetic engineering of enzymes, hormones, interferons, etc.

79. Mutations: genome, chromosome, gene. Mechanisms of mutagen activity; role of the induced mutations in the origin of the enzymopathology and hereditary human diseases.Biological importance and mechanisms of DNA reparations. Reparation of UV-induced gene mutations: xeroderma pigmentosum.

80. Hormones and their general characteristics. Role of hormones and other bioregulators in the system of the intracellular integration of the human organism functions.

81. Classification of hormones and bioregulators in correspondence of structure and mechanisms of hormone activity.

82. Reaction of the target cells on the hormone action. Membrane (ionotropic, metabotropic) and cytosol receptors.Biochemical systems of the hormonal signals intracellular transfer: G-proteins, and secondary messengers cAMP, Ca^{2+}-calmodulin, inositol-3-phosphate, and diacylglycerol.Molecular cell mechanisms of the steroid and thyroid hormone activity.

83. Neuropeptides of hypothalamus. Liberins and statins, their mechanisms of activity and biologic role.

84. Hormones of the anterior pituitary gland: somatotropin (GH), prolactin. pathological processes associated with impaired functions of these hormones. Hormones of the posterior pituitary gland. Vasopressin and oxytocin: biological, biological functions.

85. Insulin: structure, biosynthesis and secretion.Mechanism of insulin activity on the carbohydrate metabolism.Mechanism of insulin activity on the lipid metabolism.Mechanism of insulin activity on the protein and nucleotide metabolism.Glucagon and its mechanisms of activity on the carbohydrate and lipid metabolism.

86. Thyroid hormones, their structures, biological effects of T3 and T4. Disturbances of metabolic processes due to hypo- and hyperthyreosis.

87. Epinephrine, norepinephrine, dopamine, their structure, biosynthesis, physiological effects, biochemical mechanisms of activity. Pathological processes related to the disturbances of hormone functions.

88. Steroid hormones of the suprarenal glands (C_{21}-steroids), glucocorticoids and mineralocorticoids, their structures and properties.Mechanisms of glucocorticoids activity on the carbohydrate and lipid metabolism.

89. Female sex hormones estrogens, progesterone. Physiological and biochemical effects, related to the ovulation cycle phases.Male sex hormones (C_{19}-steroids). Physiological and biochemical effects of androgens, regulation of synthesis and secretion.

90. Eicosanoids: biological, biological and pharmacological influences. Aspirin and other non-steroidal anti-inflammatory agents as inhibitors of prostaglandin synthesis.

91. Biochemistry of human nutrition, the food components and nutrients, biological value of certain nutrients.Mechanisms of conversion of nutrients, proteins, carbohydrates, and lipids, in the digestive tract. The saliva, stomach and intestine enzymes.Digestion disorders of certain nutrients in the stomach and intestines, and hereditary enzymopathies of digestive processes.Microelements in human nutrition. Biological functions of certain microelements, and microelement deficiency manifestations.

92. Vitamins in human nutrition. Water-soluble and fat-soluble vitamins; exogenous and endogenous causes of vitamin deficiency.

93. Vitamin B_1 (thiamin): structure, biological properties, mechanism of action, the sources, daily need.Vitamin B_2 (riboflavin): structure, biological properties, mechanism of action, the sources, daily need.Vitamin PP (nicotinic acid, nicotinamide): structure, biological properties, mechanism of action, manifestations of deficiency, sources, the daily need.

94. Vitamin B_6 (pyridoxine): structure, biological properties, mechanism of action, the sources, the daily need.Vitamin B12 (cobalamin): biological properties, mechanism of action, manifestations of deficiency, sources, the daily need.Vitamin B_c (Folic Acid): biological properties, mechanism of action, the sources, the daily need.

95. Vitamin H (biotin): biological properties, mechanism of action, the sources, the daily need.Vitamin B_3 (pantothenic acid): biological properties, mechanism of action, the sources, and the daily need.Vitamin C (ascorbic acid): structure, biological properties, mechanism of action,

manifestations of deficiency, sources, the daily need.Vitamin P (flavonoids): structure, biological properties, mechanism of action, manifestations of deficiency, sources, the daily need.

96. Vitamin A (retinol, retinal, retinoic acid): biological properties, mechanism of action, manifestations of deficiency, sources, the daily need. Vitamin D_3 (cholecalciferol): biological properties, mechanism of action, manifestations of deficiency, sources, the daily need.

97. Vitamin K (phylloquinone, farnohinon): biological properties, mechanism of action, manifestations of deficiency, sources, the daily need.Vitamin E (α-tocopherol): biological properties, mechanism of action, manifestations of deficiency, sources, the daily need.

98. Biochemical and physiological functions of blood in the human body. Respiratory function of erythrocytes.Hemoglobin: mechanisms of it's' participation in the transport of oxygen and carbon dioxide. Types and pathological forms of human hemoglobin.

99. Buffers of the blood system. Disturbance of the acid-base balance in the body (metabolic and respiratory acidosis, alkalosis). Biochemical storage of human blood. Blood plasma proteins and their clinical and biochemical characteristics.

100. Blood plasma enzymes; significance in enzyme diagnosis of diseases of organs and tissues. Kallikrein-kinin system of blood and tissues. Medicines - antagonists of kinin formation.

101. Non-protein organic compounds of blood plasma. Inorganic components of plasma.

102. Biochemical and functional characteristics of the hemostatic system. Glottal blood system; characteristics of other factors; mechanisms of functioning of the cascade system of laryngeal blood. The role of vitamin K in coagulation reactions; medicinal properties - agonists and antagonists of vitamin K. Anticoagulant blood system; characteristics of anticoagulants. Recession of the process of laryngeal blood. Fibrinolytic blood system. Medicines that influence the process of fibrinolysis.

103. Immunoglobulins; biochemical characteristics of individual classes of human immunoglobulins. Mediators and hormones of the immune system: interleukins; interferons; protein-peptide factors of cell growth and proliferation regulation. Complement system; biochemical components of the human complement system; classical and alternative ways of activation. Biochemical mechanisms of immunodeficiency states.

104. Biochemical functions of the liver: carbohydrate, protein-synthesizing, urea-forming, bile-forming, regulation of blood lipid composition.

105. Detoxification function of the liver; types of biotransformation reactions of xenobiotics and endogenous toxins. Conjugation reactions in hepatocytes: biochemical mechanisms, functional significance.

106. Reactions of microsomal oxidation. Cytochrome P-450; electron transport chains in the membranes of the endoplasmic reticulum of hepatocytes.

107. Metabolism of porphyrins: heme structure; Scheme of biosynthesis reactions of protoporphyrin IX and heme. Hereditary disorders of porphyrin biosynthesis, types of porphyrias.

108. The role of the liver in the exchange of bile pigments. Pathobiochemistry and types of jaundice; biochemical diagnosis of jaundice; hereditary (enzymatic) jaundice. Catabolism of hemoglobin and heme (scheme); formation and structure of bile pigments.

109. Chemical composition of saliva, functions. Features of the mineralizing function of saliva. Salivary enzymes, role in digestion. The role of saliva in the supply of Ca and phosphates to enamel. Differences in composition and biological significance of oral fluid and saliva from salivary gland ducts.

110. Peculiarities of the chemical composition of the tooth (enamel). Ways of getting substances to tooth enamel. Tooth enamel proteins, the role of mineralization. Crystals of fluorapatite, hydroxyapatite, physical and chemical properties, biological role of mineralization. Chemical composition of tooth dentin. Non-collagenous tooth proteins, features of amino acid composition, role in mineralization.

111. The influence of nutrition on the state of teeth, the role of carbohydrates, proteins, trace elements and vitamins. The role of refined food carbohydrates on enamel demineralization.

112. Chemical composition of bone. Bone proteins, role in mineralization. Collagen proteins of teeth and bones. Chemical structure and role. The role of citric acid in calcium metabolism. Theory of bone and tooth mineralization. The role of Ca2+ binding elements-proteins, phosphates and citric acid in mineralization.

113. The influence of vitamins on the condition and metabolism in the tissues of the oral cavity and teeth. Hormones affecting metabolism in mineralized tissues - calcitonin, parathyroid hormone, somatotropic hormone.

114. Microelements of fluorine, strontium, etc., their biological significance for the state of teeth and bones.

115. Macroelements: calcium, phosphorus, role in tooth and bone tissue exchange.

116. Water-salt exchange in the body. Intracellular and extracellular water; exchange of water, sodium, potassium. The role of the kidneys in regulating the volume, electrolyte composition and pH of body fluids. Biochemical mechanisms of the urinary function of the kidneys. Biochemical composition of human urine in normal conditions and under conditions of development of pathological processes. Clinical and diagnostic value of urine composition analysis.

117. Renin-angiotensin system of kidneys. Hypotensive drugs - angiotensin-converting enzyme inhibitors.

118. Biochemical composition of muscles. Myofibril proteins: myosin, actin, tropomyosin, troponin. Molecular mechanisms of muscle contraction. Bioenergetics of muscle tissue.

119. Biochemistry of the nervous system. Energy exchange in the human brain. Value of aerobic oxidation of glucose; changes in the conditions of physiological sleep and anesthesia.

120. Biochemistry of neurotransmitters; receptors of neurotransmitters and physiologically active compounds. Brain peptidergic system: opioid peptides, opioid peptide receptors. Disorders of the exchange of brain mediators and modulators in mental disorders. Neurochemical mechanisms of action of psychotropic drugs.