Экзаменационные вопросы
для студентов I курса ФИС (обучение на английском языке)
специальность «Лечебное дело»
по дисциплине «Медицинская биология и общая генетика»

Test questions to the examination
for students of 1st year
Subject "Medical biology and general genetics"

1. Organization of genetic material in the non-cellular forms of life, prokaryotes and eukaryotes.
2. Levels of organization of genetic material. Gene level of organization of genetic material. The main functions, properties and classification of genes. Exon-intron organization of eukaryotic genes.
3. Structure of DNA molecule. E. Chargaff rules. Postulates of J. Watson and F. Crick.
4. Semiconservative type of DNA replication. Determination of the nucleotide sequence of DNA. Amplification of DNA. Restriction and analysis of DNA fragments.
5. Ribonucleic acid (RNA) and its main types. Transcription. Processing of mRNA in eukaryotes: capping, polyadenylation, splicing.
6. Gene regulation in prokaryotes (theory of F. Jacob and J. Monod).
7. Gene regulation in eukaryotes. The gene control of human's hemoglobin synthesis as example of complex expression of genes.
8. Genetic code and its properties. Wobble hypothesis.
9. Protein biosynthesis in the cell. Regulation of protein synthesis in eukaryotes.
10. Genetic engineering, its goals and objectives, possibility for the treatment of hereditary human pathology. Genetic engineering stages. Biotechnology, its importance for medicine.
11. Molecular structure of eukaryotic chromosomes. Nucleosome structure. Levels of DNA packing of eukaryotes: nucleosome string, chromatin fiber, interphase chromanemm, metaphase chromosome. Euchromatin and heterochromatin.
12. Chromosome level of genetic material organization. Morphology of chromosomes. Chromosome types and rules.
13. Karyotype. Characteristics of human karyotype. Chromosome staining techniques. Denver and Paris classifications of human chromosomes.
14. Genome level of genetic material organization. Genome of viruses, prokaryotes and eukaryotes.
15. Features of the human genome. General characteristics of non-coding DNA sequences and mobile genetic elements. Redundancy of the genome, its significance.
16. Nuclear genes and plasmagens. Cytoplasmic inheritance.
17. Non-cellular forms of life. Features of structure of prokaryotic cells.
18. The structure, properties and functions of the plasma membrane. Transmembrane transport of substances.
19. Cytoplasm. Cytoskeleton. Cell organelles, their structure, functions and classification.
20. The flow of substances in the cell (assimilation, dissimilation). Organization of the flow of energy in the cell during photosynthesis and chemosynthesis, fermentation, respiration. ATP is a universal source of energy.
21. The structure, properties and functions of the nucleus of a eukaryotic cell.
22. Division of a cell, its types and kinds. Interphase and its periods. Cytogenetic characteristic of a cell nucleus in the interphase.
23. The mitosis and its kinds (mitosis, meiosis, promitosis, endomitosis, and polyteny). The problem of cell proliferation in medicine.
24. Regulators of the cell cycle (cyclins and cyclin-dependent kinases).

25. Amitosis, its types and forms, biological role.
26. Cell death (apoptosis, autolysis, necrosis, netosis).
27. The genetics, its subjects, aim, and methods. Monogenic and polygenic inheritance of traits.
28. Principles of traits inheritance at monohybrid cross. The law of dominance and law of segregation, the hypothesis of "gametes purity".
29. Dihybrid and polyhybrid crosses. The law of independent assortment.
30. Inheritance of sex-linked traits.
31. The importance of genetic factors in a phenotype formation. Allele interactions: dominance, incomplete dominance, overdominance, codominance. Inheritance of human blood groups at Rh and MN systems.
32. Multiple alleles. Inheritance of human blood groups at AB0 system.
33. Pleiotropic action of genes; action field and action time of a gene; genocopy.
34. Influence of environmental factors on realization of genotype to phenotype. Qualitative and quantitative specificity of gene expression in a trait (expressivity and penetrance). Phenocopy.
35. Gene interaction: dominant and recessive epistasis, complementation, position effect of gene. Rules of polygenic inheritance. Dose of gene.
36. Chromosomes as gene linkage groups. Complete and incomplete linkage of genes. The T. Morgan's experiments showing up linked inheritance of traits.
37. Gene linkage groups in human. Genetic, cytological, physical, restriction chromosome maps and methods for their construction.
38. Diversity, its types and kinds. Characteristics of phenotypic diversity and its medical aspects.
39. Genotypic diversity. Significance of combinative diversity in maintenance of human’s genetic variability. System of crosses (inbreeding, outbreeding).
40. Mutational diversity. Classification of mutations. Mechanisms of mutation. Mutagens and carcinogens.
41. DNA repair. Photoreactivation and excision repair. Damages of DNA repair and their role in human pathology.
42. The pedigree analysis, its symbols and purposes.
43. The twins' method, its significance for studying of phenotypic diversity and predisposition of human to hereditary diseases.
44. Population statistical method, its opportunities in public health care.
45. Biochemical, cytogenetic and molecular-genetic methods, its opportunities for diagnostics of hereditary diseases.
46. Express methods: microbiological Guthrie test, determination of X and Y sex chromatin.
47. Gene diseases of human metabolism (amino acid, carbohydrate, lipids, and purine exchanges, exchange of ions, blood clotting, hemoglobinopathies).
48. Human chromosomal diseases caused by change of number and structure of autosomes and sex chromosomes.
49. Mitochondrial diseases. Concepts about diseases with a hereditary predisposition.
50. Genetic counseling, its goals and objectives. Common reasons for seeking genetic counseling. Stages of genetic counseling.
51. Methods of prenatal diagnostics of hereditary diseases (mother blood test, ultrasonography, chorionic villus sampling, amniocentesis, placentocentesis, cordocentesis, fetoscopy).
52. Sex as a biology trait. Primary and secondary sex traits. Sex-limited and sex-controlled traits. M. Lyon hypothesis about female’s mosaicism for the expression of X-linked genes.
53. The biological sex determination in a human. Significance of genes Tfm and SRY in the formation of sex. Morris syndrome.
54. The hermaphroditism (true and false). The pathological forms of sexual self-

consciousness: transsexualism, fetishism, and transvestism.

55. Reproduction – one of the main features of life systems. Types of sexual and asexual reproduction.

56. Ovo- and spermatogenesis in mammals. Features of gemetogenesis in human.

57. Morphological and functional features of human gametes.

58. Insemination (external and internal). Enzymatic processes at insemination. Fertilization, its phases and biological essence. Features of human fertilization.

59. The contemporary reproductive strategy of humankind (artificial insemination, in vitro fertilization, intracytoplasmic sperm injection).

60. Ontogenesis, its types and periods.

61. The development periods in the embryo and its characteristics: prozygote, zygot, cleavage, gastrulation, and histo-, organogenesis. The gene control of prenatal ontogenesis.

62. The intra-uterine development of human. Provisional organs. Their role in mother-fetus relationships. The critical periods in embryo development. Teratogenic factors of environment.

63. Postembryonic development and its periods. The gene control of postnatal ontogenesis. Growth and development, their neurohormonal regulation. Medical aspects of human constitution types and their classifications.

64. Ageing of organism and its biological aspects. Hypothesis of ageing. Gerontology and geriatry. Role genetic and social factors and medicine in human longevity. Clinical and biological death of organism. Eutanasia.

65. The main components and general laws of regulation of homeostasis.

66. Mechanisms of homeostasis at gene level. Classification of transplantation types: autotransplantation, syngenic transplantation, allotransplantation, and xenotransplantation. Transplantation immunity. The gene control of histocompatibility at transplantation of tissues and organs: HLA system and blood groups (AB0, MN, Rh, and other).

67. Mechanisms of homeostasis at cell level. Regeneration of tissues and organs as a result of organism's homeostasis at cell level. Physiologic regeneration and its significance for organism. Classification of tissues and organs at their regeneration abilities.

68. Reparative regeneration and its types (typical and atypical). Types of reparative regeneration in vertebrates: intracellular compensative hyperplasia of organelles, regeneratory hypertrophy, and complete regeneration. Significance of regeneration for biology and medicine.

69. Mechanisms of homeostasis at system level. Role of nervous and endocrine systems in regulation of homeostasis.

70. Population structure of humankind. Big populations, deme, isolate. Influence of isolation on gene pool of population.

71. Action of migration, mutation, and gene drift on gene pool of human populations. Natural selection as a unique evolutionary force. The general models of natural selection: directional selection, overdominance and underdominance. Founder effect and genetic bottleneck.

72. Genetic polymorphism of human populations, its biological, medical, and social aspects.

73. Genetic load and its medical significance.

74. Forms of ecology relationships in nature. The aim and subject of medical parasitology.

75. Classification of parasites: true and false, superparasite, monoxenic and heteroxenic parasites, ectoparasites (permanent and temporal) and endoparasites: intracellular, tissue, organ, and cavity parasites. Classification of parasite hosts: definite, intermediate, additional, reservoir, obligate, and facultative.

76. The ways of parasite invasion. The relationships in the system «parasite-host». Parasitocenosis.

77. Diseases caused by parasites, their classification. The concept about natural regions of parasite diseases.

78. Dysentery amoeba: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

79. African and American trypanosomes: classification, geographical distribution, features of

morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

80. Leishmania sp.: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

81. Trichomonas sp.: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

82. Lamblia: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

83. Plasmodium sp.: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

84. Toxoplasma: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

85. Cryptosporidium: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

86. Balantidium: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

87. Pneumocystis: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

88. Large liver fluke: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

89. Cat liver fluke: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

90. Lung fluke: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

91. Blood flukes: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

92. Beef tapeworm: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

93. Pork tapeworm: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

94. Dwarf tapeworm: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

95. Fish tapeworm: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

96. Dog tapeworm: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

97. Human roundworm: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

98. Whipworm: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

99. Dwarf threadworm: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

100. Dog roundworm: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

101. Trichina worm: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

102. Heart and skin worms (Dirofilaria sp.): classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

103. Pinworm: classification, geographical distribution, features of morphology, ways of invasion, life cycle, pathogenic action, methods of diagnostics and prophylaxis.

104. Features of morphology and biology, medical significance of ticks from Ixodidae

family.

105. Features of morphology and biology, medical significance of mites from Sarcoptidae and Demodicidae families.

106. Features of morphology and biology, medical significance of mites from Tyroglyphidae and Pyroglyphidae families.

107. Order Diptera. Features of morphology and biology, medical significance of Aedes, Anopheles, and Culex mosquitoes.

108. Features of morphology and biology, medical significance of flies (house, market, biting house, grey flesh, Wolfart's, and tsetse flies).

109. Features of morphology and biology, medical significance of insects from Blattoidea order.

110. Features of morphology and biology, medical significance of insects from Hemiptera order.

111. Features of morphology and biology, medical significance of insects from Anoplura order.

112. Features of morphology and biology, medical significance of insects from Aphaniptera order.

113. Poisonous fungi and characteristics of their poisons.

114. Poisonous plants and characteristics of their poisons.

115. Poisonous animals and characteristics of their poisons.