

"APPROVE"
Head of the Physiology and
Pathophysiology Department

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EXAM QUESTIONS ON MEDICAL BIOLOGY

Substantial module 1 "Cytogenetics "

1. Cell theory.
2. Main organelles of cytoplasm.
3. Cell nucleus: structure and functions.
4. Prokaryotes and eukaryotes: the main differences at cellular and molecular level.
5. Cell cycle. Mitosis.
6. Special cases of division of nucleus and cell: amitotic division, endomitosis, schizogony.
7. Sexual and asexual reproduction. Parthenogenesis.
8. Meiosis, its cytogenetic characteristic.
9. Differences of meiosis from mitosis.
10. A role of meiosis in ensuring a variety of individuals and constancy of a karyotype.
11. Gametogenesis. Differences of oogenesis from spermatogenesis.
12. Sex cells. Fertilization.
13. Chromatin and its types. Regulation of activity of genes at the chromosome level.
14. The sex chromatin, its value for medicine.
15. A structure of a mitotic chromosome at the cytologic level. Classification of chromosomes.
16. Karyotype, cytogenetic method.
17. A chromosome structure at molecular level.
18. Polytene chromosomes, their value in genetic researches.
19. "Lamp brush" chromosomes, their biological value.

Substantial module 2 "Classical genetics"

20. General genetics and human genetics: subject, tasks and methods.
21. Mendel's experiments.
22. Mendel's laws.
23. Conditions of execution of Mendel's laws.
24. Interaction of allelic genes. Multiple alleles.
25. Genetics of blood groups. ABO blood system, importance for medicine.
26. Genetics of Rhesus factor. Rhesus factor incompatibility, hemolytic jaundice.
27. Lethal and semi-lethal genes.
28. Interaction of nonallelic genes: complementation.
29. Interaction of nonallelic genes: epistasis.
30. Qualitative and quantitative characteristics, examples, mode of inheritance.
31. Gene linkage. Morgan's experiments.
32. Crossing over.
33. Eukaryotic gene mapping.
34. Cytoplasmic inheritance.
35. Sex, sex characteristics, sexual dimorphism. Hermaphroditism.
36. Genetics of sex. Determination of sex in animals and humans.
37. Sex linkage. Inheritance of sex-linked characteristics.
38. Heredity and variability. Types of nonheritable variation, their significance.
39. Types of inheritable variation, their significance.
40. Genocopies and phenocopies.

41. Penetrance and expressivity. Pleiotropy.
Substantial module 3 "Molecular genetics. Mutations"
42. Structure of deoxyribonucleotides.
43. Structure of ribonucleotides.
44. Structure of DNA molecules.
45. Types of RNAs, their structure.
46. Functions of nucleic acids.
47. Types of DNA damages and their repair. Xeroderma pigmentosum.
48. DNA replication: principles and mechanisms.
49. Gene structure and transcription in prokaryotes. Influence of antibiotics on transcription.
50. Gene structure and transcription in eukaryotes.
51. Processing of eukaryotic mRNA.
52. Regulation of gene activity at the level of transcription. Operon.
53. Genetic code, its properties.
54. Translation in prokaryotes and eukaryotes. Influence of antibiotics on translation.
55. Genetic engineering: methods.
56. Conjugation, transformation and transduction, their usage.
57. Purposes of genetic engineering. Perspectives of usage of its achievements in gene therapy.
58. Cloning of organisms and tissues.
59. Classification of mutations.
60. Gene mutations, their characteristic and origin.
61. Chromosomal (structural and genomic) mutations: classification, origin.
62. Mutations in sexual and somatic cells, their value. Mosaicism.
63. Spontaneous and induced mutations. Mutagenic factors.

Substantial module 4 "Medical genetics. Population genetics and evolution"

64. Prenatal development of human.
65. Embryonic induction.
66. Critical periods of embryonic development of human. Environmental teratogens.
67. Inborn malformations, their classification.
68. Postembryonic development of human and its periodization.
69. Aging as the stage of ontogenesis. Theories of aging. Prevention of aging.
70. Regeneration of organs and tissues. Types of regeneration.
71. Transplantation of organ and tissues, its classification.
72. Immune mechanisms of graft rejection and way of overcoming of rejection.
73. Human as specific object of genetic research. Problems of human genetics.
74. Twin study.
75. Genealogical method.
76. Classification of gene disorders, their general characteristic.
77. Enzymopathies: causes, general characteristic.
78. Phenylketonuria as gene disorder: causes, symptoms, diagnosis.
79. Hemoglobinopathies as gene disorders. Sickle-cell anemia.
80. Biochemical method of studying of hereditary diseases. Screening programs.
81. General characteristic of chromosomal diseases.
82. The syndromes associated with autosomes: causes, anomalies of development, diagnosis.
83. The syndromes associated with gonosomes: causes, anomalies of development, diagnosis.
84. Inborn and hereditary diseases, diseases with hereditary predisposition, multifactorial diseases.
85. Prenatal diagnosis of hereditary diseases.
86. Genetic consultation as prevention of hereditary diseases.
87. Population genetics: methods, objects and research problems.
88. Species, population. Structure of human population. Demographic indicators.
89. Idealized population. Hardy-Weinberg's law, its usage.
90. Fate of a mutation in population.
91. Genetic drift. Founder effect.
92. Migration, its influence on the population.
93. Selection, its influence on the population. Specific action of selection in human population.
94. Types of crossings, their influence on the population.
95. Autosomal recessive and autosomal dominant inheritance.

96. Theories of evolution.
97. Origin of human. Main stages of anthropogenesis. Proofs of evolution of human. Rudiments, atavisms.
98. Conception about races and origin of human races. Criticism of racism.
99. Biogenetic law. Law of homologous series of variability.
Substantial module 5 "Human ecology. Medical parasitology"
100. Biosphere, its structure and functions.
101. Ecology: importance for medicine. Ecological factors.
102. Characteristic of biocenosis and biogeocenosis. Main components of ecosystem.
103. Anthropogenous ecosystems.
104. Adaptation of human to environment. Ecological types of people.
105. Fungi that are poisonous for man.
106. Plants that are poisonous for man.
107. Coelenterates and fishes that are poisonous for man.
108. Forms of relationships between organisms. Parasitism. Classification of hosts.
109. Classification of parasites.
110. Interaction of parasite and host, morphological and physiological adaptation of parasites.
111. Ways of penetration of parasites into the host's organism. Autoinvasion, reinvasion.
112. Vectors of causative agents of diseases and their classification.
113. Transmissible diseases, their types. Biological principles of prevention of transmissible diseases.
114. Diseases with natural foci and their prevention.
115. Anthroponoses and zoonoses. Outstanding scientists-parasitologists.
116. General principles of prevention of parasitic diseases.
117. General characteristic of subkingdom Protozoa.
118. Subphylum Sarcodina: amoebas that live in a human body, their morphology. Diagnosis of amebiosis.
119. Life cycle of dysenteric amoeba, its pathogenic influence, prevention of amebiosis.
120. General characteristic of subphylum Flagellata.
121. Giardia (Lamblia).
122. Trichomonads.
123. Skin leishmaniases and their causative agents.
124. Visceral leishmaniases and their causative agents.
125. Trypanosomes.
126. General characteristic of type Sporozoa.
127. Life cycle of malarial plasmodium.
128. Pathogenic influence of malarial plasmodia. Types of malaria.
129. Diagnosis and prevention of malaria.
130. Life cycle of Toxoplasma, ways of infection of human.
131. Pathogenic influence of causative agent, diagnosis and prevention of toxoplasmosis.
132. General characteristic of the phylum Infusoria. Balantidium.
133. Methods of diagnostics of protozoan diseases.
134. Helminths and their classification. Geohelminthes and biohelminthes.
135. Phylum Plathelminthes, class Flukes: general characteristic, medical value.
136. Morphology and life cycle of liver fluke.
137. Pathogenic influence of causative agent, diagnosis and prevention of fascioliasis.
138. Morphology and life cycle of cat liver fluke.
139. Pathogenic influence of causative agent, diagnosis and prevention of opisthorchiasis.
140. Chinese liver fluke.
141. Metagonimus.
142. Lancet fluke.
143. Lung fluke.
144. Morphology, life cycles of blood flukes.
145. Pathogenic influence of causative agents, diagnosis and prevention of schistosomiasis.
146. Nanophyetus.
147. Class Tapeworms: general characteristic, medical value.
148. Morphology and life cycle of broad tapeworm.
149. Pathogenic influence of causative agent, diagnosis and prevention of diphyllbothriosis.

150. Morphology and life cycle of beef tapeworm.
151. Pathogenic influence of causative agent, diagnosis and prevention of beef tapeworm infection.
152. Morphology and life cycle of pork tapeworm.
153. Pathogenic influence of causative agent, diagnosis and prevention of pork tapeworm infection.
154. Cysticercosis: causative agent, ways of infection, pathogenic influence of causative agent, diagnosis and prevention.
155. Differential diagnosis of taeniid infestations.
156. Dwarf tapeworm.
157. Morphology and life cycles of dog tapeworm and *Echinococcus multilocularis*.
158. Pathogenic influence of causative agents, diagnosis and prevention of echinococcosis and alveococcosis.
159. General characteristic of phylum Roundworms.
160. Medical importance of roundworms.
161. Morphology and life cycle of giant intestinal roundworm.
162. Pathogenic influence of causative agent, diagnosis and prevention of ascariasis.
163. Pinworm.
164. Whipworm.
165. Life cycle of trichinella, diagnosis of trichinosis.
166. Pathogenic influence of causative agent and prevention of trichinosis.
167. Tunnel worm and American hookworm.
168. Dwarf threadworm.
169. Dragon worm.
170. Bancroft's filaria and *Brugia*.
171. Blinding filaria.
172. Eye worm.
173. *Dirofilaria*.
174. Helminthoses in children groups and their prevention.
175. Methods of diagnostic of helminthoses.
176. Phylum Annelida. Medicinal leech.
177. Medical importance of mollusks.
178. Phylum Arthropoda: classification, general characteristic.
179. Medical importance of crustaceans.
180. Poisonous arthropods.
181. Ixodidae ticks that have medical importance.
182. Argasidae ticks that have medical importance.
183. Gamasoidea ticks that have medical importance.
184. Itch mite: structure and development, medical importance.
185. Demodex: structure and development, medical importance.
186. General characteristic of insects, their classification, medical importance.
187. Lice: species, structure and development, medical importance.
188. Fleas: species, structure and development, medical importance.
189. Bugs: species, structure and development, medical importance.
190. Cockroaches: species, structure and development, medical importance.
191. Order Diptera: general characteristic, classification.
192. Family Culicidae: general characteristic, medical importance, differences between malarial and non-malarial mosquitoes.
193. Sand flies Simuliidae and Phlebotomidae, biting midges: general characteristic, medical importance.
194. Bloodsucking insects, their medical importance, methods of control and prevention of diseases which are vectored by them.
195. Flies: general characteristic. Typhoid fly and screwworm flies, their medical importance.
196. Bloodsucking flies, their medical importance.
197. Wohlfahrtia fly and botflies, their medical importance.