



МЕДИЦИНСКИ УНИВЕРСИТЕТ – ПЛОВДИВ  
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## Syllabus in HUMAN BIOLOGY for Medical students

### MOLECULAR AND CELL BIOLOGY

1. Nucleic acids. DNA – localization and structure. The double helix model. Chargaff's rules. DNA conformations.
2. Nucleic acids. Linear and circular DNA. DNA functions. Mitochondrial DNA – characteristics, functions.
3. Nucleic acids. RNA – structure and types, functions. Differences between RNA and DNA.
4. Replication of DNA. Necessary elements and mechanism. Replication of linear DNA molecules. Fidelity of replication.
5. Replication of circular DNA molecules. Differences between prokaryotic and eukaryotic replication.
6. Transcription. Necessary elements, stages and mechanism. Reverse transcription.
7. Transcription in prokaryotes and in eukaryotes – comparison. Processing of mRNA.
8. Translation. Necessary elements, stages and mechanism.
9. Transfer of genetic information. The Central dogma. The genetic code – characteristics.
10. Gene therapy – vectors, principles.
11. Mutations – characteristics and types. Gene rearrangements and point mutations.
12. Genetic engineering – pre and post – zygotic selection, in vitro fertilization.
13. Genetic engineering – cellular hybridization, fusion of embryos (hymeras), animal cloning.
14. Molecular engineering. Recombinant DNA technologies.
15. Submicroscopic structure of chromosomes. Chromatin.
16. Microscopic structure of chromosomes. Types of chromosomes.
17. Epigenetic control of gene expression. X-chromosome inactivation. Genomic imprinting.
18. The normal human karyotype. Numerical chromosomal mutations – aneuploidy and polyploidy.
19. Structural chromosomal mutations – deletions, duplications, inversions, translocations.
20. The eukaryotic cell cycle. Cell cycle regulation – cyclins and Cdk.
21. Apoptosis. Characteristics. Genetic control, mechanisms, detection.
22. Tumor biology.
23. Biology and genetics of cancer. Tumor-suppressor genes and oncogenes.

24. Meiosis – mechanism and stages. Differences between mitosis and meiosis.
25. Gametogenesis. Spermatogenesis. Oogenesis.
26. Fertilization.
27. Basic molecular biology techniques - DNA electrophoresis, PCR, qPCR, DNA sequencing.

## **IMMUNOLOGY**

28. Innate and adaptive immunity. Characteristics of the immune response.
29. Innate immunity – factors and mechanisms.
30. Adaptive immunity. Fate of the antigen.
31. The immune system. Central and peripheral lymphoid organs.
32. Antigens – characteristics, types. Haptens.
33. Human alloantigens. Blood group antigens ABO (H), Se and Rhesus.
34. Cells and molecules of the immune system. B-cells, T-cells. Characteristics and functions.
35. APC, NK-cells. Characteristics and functions.
36. Intercellular communications in the immune response. Activation of T- and B-cells. Cytokines.
37. Kinetics of the immune response. Humoral and cellular immunity. Primary and secondary immune response. Immunological memory.
38. The Complement system – characteristics and functions.
39. Antibodies – structure and function. Immunoglobulin classes and characteristics.
40. MHC – complex. Structure and function. MHC restriction.
41. Transplantation immunology. Immune response in graft rejection. Graft versus host reaction.
42. Tumor immunology. Tumor antigens. Tumor escape mechanisms. Immune response to tumors.
43. Immunobiology of HIV/AIDS. AIDS.
44. Hypersensitivity reactions – general characteristics and types.
45. Antigen-antibody reactions. Agglutination, precipitation, immunoelectrophoresis, Western blotting, ELISA, immunofluorescence, flowcytometry, immunohistochemistry - principles and application.

## **BIOLOGY OF PARASITES**

46. Parasitism as a biological phenomenon. Parasites and hosts. Adaptation of the parasite to the host.
47. Relationships and interactions between the parasite and the host.
48. Subkingdom *Protozoa*. Subphylum *Sarcodina*. Genus *Entamoeba* – *Entamoeba histolytica*, *Entamoeba coli*, *Entamoeba gingivalis*.
49. Subkingdom *Protozoa*. Subphylum *Mastigophora*. Order *Kinetoplastida*. Genus *Trypanosoma* – *Trypanosoma gambiense*, *Trypanosoma cruzi*.
50. Subkingdom *Protozoa*. Subphylum *Mastigophora*. Order *Kinetoplastida*. Genus *Leishmania* – *Leishmania donovani*, *Leishmania tropica*.
51. Subkingdom *Protozoa*. Subphylum *Mastigophora*. Order *Diplomonadida*. Genus *Trichomonas* – *Trichomonas hominis*, *Trichomonas tenax*, *Trichomonas vaginalis*.

Genus *Giardia* - *Giardia lamblia*.

52. Class Sporozoa. Malarial plasmodia - types. Morphology and biological cycle.
53. Class Sporozoa. *Toxoplasma gondii*.
54. Subkingdom Protozoa. Phylum Ciliophora. *Balantidium coli*.
55. Phylum Platyhelminthes. Class Trematoda. Morphology and general characteristics. *Fasciola hepatica*. *Dicrocoelium dendriticum*. *Opisthorchis felineus*.
56. Genus *Schistosoma*. *Sch. haematobium*. *Sch. japonicum*, *Sch. mansoni*.
57. Phylum Platyhelminthes. Class Cestoda. Morphology and general characteristics. *Diphyllobothrium latum*.
58. Phylum Platyhelminthes. Class Cestoda. *Taenia solium*. *Taenia saginata*.
59. Phylum Platyhelminthes. Class Cestoda. *Echinococcus granulosus*.
60. Phylum Nematelminthes. Class Nematoda. Morphology and general characteristics. *Ascaris lumbricoides*.
61. Class Nematoda. *Enterobius vermicularis*. *Trichuris trichiura*. *Trichinella spiralis*. Phylum Nematelminthes. Class Nematoda. *Strongiloides stercoralis*. *Ancylostoma duodenale*. *Wuchereria bancrofti*. *Dracunculus medinensis*.
62. Phylum Arthropoda. Order Acarina - morphology, biological cycle, medical importance of ticks. *Sarcoptes scabiei*.
63. Class Insecta. Morphology and general characteristics. Order Anoplura /lice/ - *Pediculus capitis*, *Pediculus vestimenti*, *Phthirus pubis*.
64. Order Aphaniptera /fleas/.
65. Order Diptera - genus *Culex*, genus *Anopheles*. *Phlebotomus papatasi*.
66. Family Muscidae, *Glossina palpalis*.

Recommended literature:

1. Bios instant notes. Molecular Biology by A. McLennan, A. Bates, P. Turner, M. White. 2013, 4th edition, Garland Science, Taylor & Francis Group.
2. Bios instant notes. Immunology by P. Lydyard, A. Whelan, M. Fanger. 2003, 3rd edition, Garland Science, Taylor & Francis Group.
3. Basic Immunology: Functions and Disorders of the Immune System by A. K. Abbas, A.H. Lichtman, Shiv Pillai. 2012, 4th edition, Elsevier.
4. Human Biology by C. Starr and B. McMillan B. 2014, 10th edition, BOOKS/COLE.
5. Alexandrov V., Y. Feodorova, M. Draganova, M. Kazakova, N. Mehterov, V. Sarafian, Parasitology. Manual for first year students in medicine and dental medicine. Plovdiv, 2023.
6. Feodorova Y., M. Kazakova, V. Alexandrov, N. Mehterov, V. Sarafian. Ed. V. Sarafian. Tests in Medical Biology. ISBN: 978-619-7085-88-4, 2017.
7. Sarafian V., M. Kazakova, M. Draganova, N. Mehterov. Ed. V. Sarafian. Practical Book. Medical Biology for first year students. 4th edition, Medical University-Plovdiv, ISBN: 978-619-237-041-1, 2023.

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