



МЕДИЦИНСКИ УНИВЕРСИТЕТ – ПЛОВДИВ  
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## Syllabus in BIOLOGY for Pharmacy 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. Molecular diagnostics – DNA analysis: DNA electrophoresis, PCR, qPCR, DNA sequencing.
11. Mutation – 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, vector systems, transfer of foreign genes into somatic cells. Gene therapy – vectors, principles
15. Submicroscopic structure of chromosomes. Chromatin.
16. Microscopic structure of chromosomes. Types of chromosomes. The normal human karyotype.
17. Structural chromosomal mutations – deletions, duplications, inversions, translocations.
18. Numerical chromosomal mutations – aneuploidy and polyploidy.
19. Epigenetic control of gene expression. X-chromosome inactivation.
20. The eukaryotic cell cycle. Mitosis. Stages of mitosis. Cell cycle regulation – cyclins and Cdk.
21. Apoptosis. Characteristics. Genetic control, mechanisms, detection.
22. Biology and genetics of cancer. Tumor-suppressor genes and oncogenes.
23. Meiosis – mechanism and stages. Differences between mitosis and meiosis.
24. Gametogenesis. Spermatogenesis. Oogenesis.
25. Fertilization.

## **IMMUNOLOGY**

26. Innate and adaptive immunity. Characteristics of the immune response. Innate immunity-mechanisms.
27. Adaptive immunity. Fate of the antigen.
28. The immune system. Central and peripheral lymphoid organs.
29. Antigens – characteristics, types. Haptens.
30. Human alloantigens. Blood group antigens ABO (H), Se and Rhesus.
31. Cells and molecules of the immune system. B-cells, T-cells. Characteristics and functions.
32. APC, NK-cells. Characteristics and functions.
33. Kinetics of the immune response. Humoral and cellular immunity. Primary and secondary immune response.
34. The Complement system – characteristics and functions.
35. Antibodies – structure and function.
36. Immunoglobulin classes and characteristics.
37. MHC – complex. Structure and function. MHC restriction.
38. Hypersensitivity reactions – general characteristics and types.

### 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 Starr C. and McMillan B. 2014, 10th edition, BOOKS/COLE.
5. Feodorova Y., M. Kazakova, V. Alexandrov, N. Mehterov, V. Sarafian. Ed. V. Sarafian. Tests in Medical Biology. ISBN: 978-619-7085-88-4, 2017.
6. Gevezova M., M. Draganova, M. Kazakova, N. Mehterov, D. Minchev, V. Sarafian, Y. Sbirkov. Ed. V. Sarafian and M. Kazakova. Practical Book. Medical Biology for first year Pharmacy students. Plovdiv, ISBN: 978-619-237-060-2, 2022.

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