**Syllabus for PHARMACY students, academic year 2021-22**

The syllabus contains 46 questions, subdivided into following sections:

**I. Biopolymers - structure, synthesis and self-assembly**
**II. Genome organization and gene expression**
**III. Cell cycle and cell communications**
**IV. Reproduction - mechanisms of fertilization and early embryogenesis**
**V. Methods to study biopolymers and cells - molecular basis**
**VI. Immunity - molecular and cellular basis**

## I. Biopolymers - structure, synthesis and self-assembly

1. Proteins. Protein domains. Protein families.
2. Nucleic acids. DNA. RNA
3. Transcription.
4. RNA processing.
5. Genetic code. Translation.
6. Proteins after translation: sorting, folding, modifications, degradation.
7. DNA replication.
8. RNA replication. Reverse transcription

## II. Genome organization and gene expression

9. Prokaryotic genome and regulation of gene expression.
10. Eukaryotic genome and regulation of gene expression.
11. Cytoplasmic (extrachromosomal) inheritance in prokaryotes and eukaryotes.
12. General (homologous) recombination. Molecular mechanisms of crossing over.
13. Reproduction of viruses.
14. Chromatin. Nucleosomes.
15. Human karyotype. Types of chromosomes.
16. Gene mutations. Mechanisms and mutagenic factors.
17. Chromosomal mutations. Evolution of karyotype.
18. Genes and alleles. Dominance and recessivity - mechanisms, medical examples. Penetrance and expressivity.

## III. Cell cycle and cell communications

19. Cell cycle. Mitosis. Cell cycle control.
20. Cell senescence. Cell death: apoptosis, necrosis.

## IV. Reproduction - mechanisms of fertilization and early embryogenesis

21. Meiosis. Origin of germ cells.
22. Spermatogenesis. Mammalian spermatozoa.
23. Oogenesis. Mature mammalian ova.
24. Fertilization. Interaction of maternal and paternal genomes.
25. Assisted reproduction: IVF, ICSI.
26. Embryonic development – early stages (zygote to neurula).
27. Preimplantation mammalian embryo.

## V. Methods to study biopolymers and cells - molecular basis

28. Methods of karyotyping and chromosome analysis.
29. Basic methods in molecular biology – electrophoresis, PCR, blotting, sequencing.
30. Immunological methods. Diagnosis of viral infections.
31. Recombinant DNA technology – restriction endonucleases, DNA vectors, recombinant proteins.
32. Cell micromanipulations.
33. Transgenic animals. Gene therapy.

## VI. Immunity - molecular and cellular basis

34. Innate immunity.
35. Structure of antibodies.
36. Functions of antibodies.
37. Molecules of cell-mediated immunity.
38. Cytotoxic and helper T lymphocytes.
39. Genetic basis of antibodies and T-cell receptors.
40. Lymphocyte differentiation in central lymphoid organs.
41. Lymphocyte differentiation in peripheral lymphoid organs. Immune response
42. Immune memory.
43. Immune tolerance. Regulatory T lymphocytes.
44. Transplantation immunity.
45. Blood group alloantigens. ABO and H blood groups.
46. Rhesus blood groups.