**Questions for practical lessons.**

**Topic 1. Microscope. Microscopy. Technique of microslide preparing.**

1. Structure of light microscope.
2. Microscopy.
3. Temporary and permanent micropreparation.

**Topic 2. Types of cell organization. Prokaryotes and eukaryotes. Structure of plasma membrane.**

1. Definition of life
2. Levels organization of living matter.
3. Types of cell organization. Notion of eukaryotic and prokaryotic cells.
4. Structure and functions of eukaryotic cell organells.
5. Structural differences between animal and plant cell.
6. Structure and functions of cell membrane
7. Transport across membranes (passive and active transport, exocytosis and endocytosis)

**Topic 3. The cell as structural and functional unit of living matter.**

1. Cell cycle, its periods and their description. significance of interphase.
2. Description of mitosis phases. Biological and genetical significance of mitosis. Peculiarities of plant cell and animal cell mitosis.
3. Mitotic activity of tissue. Regulation of mitotic activity.
4. Amitosis. Endomitosis.
5. Stages of the cell metabolism.
6. **Control test (MSQ) “Cell biology”.**

**Topic 4. Principles of molecular biology of the cell. Nucleic acids and their role in realization of genetic information.**

1. Molecular structure of DNA, its biological and genetic significance.
2. Up-to-date conception of the DNA replication mechanism.
3. The genetic code, properties of genetic code and its biological sense.
4. Molecular structure of RNA, its kinds, localization and role in the cell.
5. Expression of genetic information in the cell ( mechanism of transcription and translation: initiation, elongation, termination)

**Topic 5. Organization of genome and expression of genetic information in eukaryotic and prokaryotic cells.**

1. Definition of gene. Molecular structure and functions of the gene, its kind.
2. Definition of genome. Difference between genome organization of prokaryotic and eukaryotic cells.
3. Organization and expression of eukaryotic and prokaryotic genes.
4. Regulation of gene activity as example of lactose operon.

**Topic 6. Genetic apparatus of eukaryotic cell. Human karyotype.**

1. Genetic apparatus of eukaryotic cell (genome and plasmon).
2. Plasmon, its organization. Peculiarities of cytoplasmic traits inheritance.
3. Role of chromosomes in inheritance. Structure and classification of metaphase chromosomes.
4. Chemical structure of chromosomes.
5. Structure of interphase chromosome (nucleosome organization). Packing ratio of chromosome during cell cycle.
6. Euchromatin and heterochromatin, their peculiarities and functions.
7. Definition of karyotype. The rules of karyotype.
8. Autosomes and sex chromosomes. Chromosomal sex determination.

**Topic 7. Control test of molecular biology.**

**Topic 8. Reproduction of organisms.**

1. Reproduction of organisms, its forms. Biological advantages of asexual and sexual reproduction. Sexual dimorphism.
2. Description of meiosis and its genetical significance.
3. Structure and functions of sperm and ova. Types of ova cells. Differences between sex and somatic cells.
4. Gametogenesis in animals (spermatogenesis and oogenesis). Differences between these two processes.

**Topic 9.** **Embryonic development of organisms.**

1. Ontogenesis, definition, types and periods of ontogenesis.
2. Embryonic development, its periods.
3. Fertilization. Role of acrosomal and cortical reactions.
4. Cleavage. Ways of cleavage and types of blastula.
5. Gastrulation. Ways of gastrulation and formation of mesoderm.
6. Histogenesis and organogenesis. Derivatives of the germ layers.
7. Provisory organs, their functions.

**Topic 10. Genetics. The laws of heredity.**

1. Basic terms of genetics: inheritance, genotype, phenotype, dominance, recessiveness, homozygote, heterozygote, gene, locus, allele, homologous chromosomes, hybridological method.
2. Gene is a unit of genetic material, its properties.
3. Laws of inheritance transmission in monohybrid and dihybrid crosses.
4. Conditions for mendelian type inheritance of trait.
5. Types of allelic genes interaction: complete dominance, incomplete dominance, codominance.
6. Multiple allelism, origin,inheritance of the traits,determinedby multiple alleles.
7. ABO blood group inheritance asan example of multiple allelism.
8. Notion of penetrance and expression of the genes. Pleiotropy.

**Topic 11. Interaction of nonallelic genes.**

1. Complementary: definition, examples
2. Epistasis: definition, dominant and recessive epistasis, examples.
3. Polygenic inheritance: definition, polygenes. Qualitative and quantitative polymery.

**Topic 12.** **Linkage of genes. Sex-linked inheritance.**

1. Independent assortment genes and linked genes. Complete and incomplete linkage of genes. Crossing-over and Morgan’s rule.
2. The statements of chromosome theory of inheritance. The chromosome map.
3. Autosome inheritance and sex-linked inheritance, main regularities and example of traits.

**Topic13. Revision of studied topics belonging to Genetics.**

Solving the genetic tasks for monohybrid and dihybrid crossing, interaction of nonallelic genes, sex-linked and autosome inheritance.

**Topic 14. Control test on “Genetics”.**

**Topic 15. Variability.**

1. Variability: definition and types. Forms of phenotypical and genotypical variability.
2. Modificational variability, its types and example for human. Phenotypical effect and genotypical mechanism of modification, significance.
3. Teratogeny: definition and origin, teratogenic factors. Phenotypical effect and genotypical mechanism of teratogeny, significance.
4. Combinative variability: mechanisms of recombination and phenotypical effect of its, significance and example for human.
5. Mutatons: definition, classification of mutations according to levels organization in nature and reason of appearance.
6. Mutations of genes: base-pair substitution and frameshift, mechanism and primary phenotypical effects of its, example of human diseases are due to these mutations.

**Topic 16. Genome and chromosome mutations.**

1. Genome mutations, mechanisms of its appearance.
2. Polyploidy, types and examples, significance.
3. Aneuploidy, monosomy and trysome. Examples of human diseases are due to these mutations.
4. Chromosome aberrations, classification and mechanisms. . Examples of human diseases are due to these mutations.
5. Interchromosomal aberrations, types of translocations.
6. Spontaneous and induced mutations. Classification of mutagenes.

**Topic 17. Control test of “Variability”.**

**Topic 18-19. Human genetics.**

1. The human being asa subject of genetics.
2. Methods of human genetics:
   1. Genealogic method (pedigree analysis): essence, stages and significance of these method.
   2. Cytogenetic method: essence, stages and significance of these method.
   3. Biochemical method: essence, stages and significance of these method.
   4. Twins method: type of twins and essence, stages and significance of these method.

**Topic 20. Final control of first semester.**