

**OBJECTIVES:** To enable the students to:

- Understand the origin of cell and distinguish between prokaryotic and eukaryotic cell
- Describe the role of different cell organelles in maintenance of life activities
- Appraise the basic concepts of heredity, variations and gene interaction
- Gain knowledge on polygenic, sex-linked, and multiple allelic modes of inheritance.
- Acquaint with basic concepts of molecular biology's to how characters are expressed with a co-ordinated functioning of replication, transcription and translation in all living beings.
- Describe the origin of life, the forces and forces of evolution and understand. The role of variation and mutations in evolution of organisms.

**COURSE OUTCOMES:** By the end of the course, students will be able to

- **CO1:** Understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.
- **CO2:** Correlate the structure of animal cell organelles to their functions in eukaryotic cells.
- **CO3:** Understand the history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals
- **CO4:** Acquire in depth knowledge on various aspects of genetics involved in sex determination, human karyotyping and mutations of chromosomes resulting in various disorders.
- **CO5:** Describe the central dogma of molecular biology and flow of genetic information from DNA to proteins.
- **CO6:** Summarize the principles and forces of evolution of life on earth, the process of evolution of new species and apply the same to develop new and advanced varieties of animals for the benefit of the society.

#### **UNIT-I: CELL BIOLOGY:**

- 1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma Electron microscopic structure of animal cell.
- 1.2 Plasma membrane—Models and functions of plasma membrane.
- 1.4 Structure and functions of Golgi complex, Endoplasmic Reticulum and Lysosomes
- 1.5 Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes  
(**Note:** 1.General pattern of study of each cell organelle –Discovery, Occurrence, Number, Origin, Structure and Functions with suitable diagrams)  
2. Need not study cellular respiration under mitochondrial functions)

#### **UNIT-II: GENETICS –I:**

- 2.1 Mendel's work on transmission of traits
- 2.2 Gene Interaction –Incomplete Dominance, Codominance, Lethal Genes
- 2.3 Polygenic inheritance (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance.)
- 2.4 Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo – diploidy types of sex determination)
- 2.5 Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)

#### **UNIT-III: GENETICS –II:**

- 3.1 Mutations & Mutagenesis
- 3.2 Chromosomal Disorders (Autosomal and Allosomal)
- 3.3 Human Genetics – Karyotyping, Pedigree Analysis (basics)
- 3.4 Basics on Genomics and Proteomics

**UNIT-IV: MOLECULAR BIOLOGY:**

4.1 Central Dogma of Molecular Biology

4.2 Basic concepts of –

- a. DNA replication – Overview (Semi-conservative mechanism, Semi-discontinuous mode, Origin & Propagation of replication fork)
- b. Transcription in prokaryotes – Initiation, Elongation and Termination, Post-transcriptional modifications (basics)
- c. Translation – Initiation, Elongation and Termination

4.3 Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes.

**UNIT-V: EVOLUTION**

5.1 Origin of life

5.2 Theories of Evolution: Lamarckism, Darwinism, Germ Plasm Theory, Mutation Theory

5.3 Neo-Darwinism: Modern Synthetic Theory of Evolution, Hardy-Weinberg Equilibrium

5.4 Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection, Speciation

**CO-CURRICULAR ACTIVITIES (Suggested):**

- Model of animal cell
- Working model of mitochondria to encourage creativity among students
- Photo album of scientists of cell biology
- Charts on plasma membrane models/cell organelles
- Observation of Mendelian / Non-Mendelian inheritance in the plants of college botanical garden or local village as a student study project activity
- Observation of blood group inheritance in students, from their parents and grand parents
- Karyo typing and preparation of pedigree charts for identifying diseases in family history
- Charts on chromosomal disorders
- Charts on central dogma/lac operon/ genetic code
- Model of semi-conservative model of DNA replication
- Model of RNA and translation mechanism
- Powerpoint presentation of transcription or any other topic by students
- Draw geological time scale and highlight important events along the timeline
- Chart on industrial melanism to teach directed selection, Darwin's finches to teach genetic drift, collection of data on weight of children born in primary health centres to teach stabilizing selection etc.

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