ST. JOSEPH’S COLLEGE FOR WOMEN(A), VISAKHAPATNAM

# III SEMESTER ZOOLOGY Time:4 HRS./WEEK

Z 3503(3) **CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION** MAX.MARKS:100

w.e.f. 2020-2021 (20AH) **SYLLABUS**

# 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 all elic 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 ories and forces of evolution and understand. The role of variation sand mutations in evolution of organisms.

**COURSEOUTCOMES:** 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 of aspects of genetics involved in sex determination, human karyo typing and mutations of chromosomes resulting in variousdisorders.
* **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. Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma Electron microscopic structure of animal cell.
  2. Plasma membrane–Models and functions of plasma membrane.
  3. Structure and functions of Golgi complex, Endo plasmic Reticulum and Lysosomes
  4. 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:**

2.1Mendel’swork ontransmission oftraits

2.2GeneInteraction –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)

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# UNIT–III:GENETICS–II:

* 1. Mutations&Mutagenesis
  2. Chromosomal Disorders (Autosomal and Allosomal)
  3. HumanGenetics – Karyotyping,PedigreeAnalysis(basics)
  4. BasicsonGenomicsandProteomics

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# UNIT-IV:MOLECULAR BIOLOGY:

* 1. CentralDogmaofMolecularBiology
  2. Basic concepts of –
     1. DNA replication – Overview (Semi-conservative mechanism, Semi-discontinuousmode,Origin &Propagation ofreplicationfork)
     2. Transcription in prokaryotes – Initiation, Elongation and Termination, Post-transcriptionalmodifications(basics)
     3. Translation– Initiation,ElongationandTermination
  3. Gene Expression in prokaryotes (Lac Operon); Gene Expression ineukaryotes.

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# UNIT-V: EVOLUTION

* 1. Origin of life
  2. Theories of Evolution: Lamarckism, Darwinism, Germ Plasm Theory, Mutation Theory
  3. Neo-Darwinism: Modern Synthetic Theory of Evolution, Hardy-Weinberg Equilibrium
  4. Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection,Speciation

# CO-CURRICULAR ACTIVITIES (Suggested):

* Modelofanimalcell
* 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 botanicalgardenor local villageasastudentstudy projectactivity
* 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/lacoperon/ genetic code
* Modelofsemi-conservativemodelofDNAreplication
* ModelofRNAandtranslationmechanism
* Powerpoint presentationof transcription or any other topic bystudents
* Drawgeologicaltimescaleandhighlightimportanteventsalongthetimeline
* Chart on industrial melanism to teach directed selection, Darwin‟s finches to teach geneticdrift, collection of data on weight of children born in primary health centres to teach stabilizing selection etc.

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16. Campbell, N.A. and ReeceJ.B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.
17. Douglas,J.Futuyma(1997). EvolutionaryBiology.SinauerAssociates.
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19. JamesD. Watson,NancyH.Hopkins „MolecularBiologyoftheGene‟
20. JanM. Savage. Evolution, 2nded, Oxford and IBH Publishing Co., New Delhi.
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# III SEMESTER ZOOLOGY Time:2hrs./week

Z 3553 (2) **CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION** MAX.MARKS:50

w.e.f. 20-21 (“AH”) **PRACTICAL SYLLABUS**

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

* + Develop skill in the usage of laboratory microscope
  + Gain Hands-on experience of different phases of cell division by experimentation
  + Develop skills on human karyotyping and identification of chromosomal disorders
  + Apply the basic concept of inheritance for applied research
  + Be familiar with phylogeny and geological history of origin & evolution of animals.

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

* + CO1. Examine and differentiate various types of cells and their structure.
  + CO2. Observe the various stagesof mitotic divisions by using microscopy technique.
  + CO3. Solve various genetic problems related to sex-linked inheritance and blood grouping.
  + CO4. Identify and summarise chromosomal abnormalities
  + CO5. Compare and contrast homologous and analogous organs with reference to their evolutionary origin.

# CELLBIOLOGY:

* 1. Preparationoftemporary slides ofMitoticdivisionswith onionroottips
  2. ObservationofvariousstagesofMitosisandMeiosiswithpreparedslides
  3. Mountingof salivary gland chromosomes of Chiranomous

# GENETICS:

* 1. Study of Mendelian inheritance using suitable examples and problems
  2. Problem son blood group inheritance and sex linked inheritance
  3. Studyofhumanabnormalkaryotypes(Down’ssyndrome,Edwards,syndrome,Patausyndrome,Turner’s syndromeand Klinefeltersyndrome)

# EVOLUTION:

* 1. Studyoffossilevidences
  2. Studyofhomologyand analogyfromsuitablespecimens andpictures
  3. Evolution of Man with pictures
  4. Phylogenyofhorsewithpictures
  5. StudyofGeneticDriftbyusingexamplesofDarwin’sfinches(pictures)
  6. Visit to any Zoological Museum/park /sanctuaryand submission of report.

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