AP STATE COUNCIL OF HIGHER EDUCATION

w.e.f. 2020-21 (Revised in April, 2020)

ZOOLOGY – SEMESTER III

PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

HOURS:60 (5X12) **Max. Marks:100**

Course Outcomes:

The overall course outcome is that the student shall develop deeper understanding of what life is and how it functions at cellular level. This course will provide students with a deep knowledge in Cell Biology, Animal Biotechnology and Evolution and by the completion of the course the graduate shall able to –

CO1 To understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.

CO2 Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.

CO3 To understandthe history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals

CO4 Acquiring in-depth knowledge on various of aspects of genetics involved in sex determination, human karyotyping and mutations of chromosomes resulting in various disorders

CO5 Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins.

CO6 Understand 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

Learning Objectives

- To understand the origin of cell and distinguish between prokaryotic and eukaryotic cell
- To understand the role of different cell organelles in maintenance of life activities
- To provide the history and basic concepts of heredity, variations and gene interaction
- To enable the students distinguish between polygenic, sex-linked, and multiple allelic modes of inheritance.
- To acquaint student with basic concepts of molecular biology as to how characters are expressed with a coordinated functioning of replication, transcription and translation in all living beings
- To provide knowledge on origin of life, theories and forces of evolution
- To understand the role of variations and mutations in evolution of organisms

ZOOLOGY SYLLABUS FOR III SEMESTER

PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

HOURS: 60 (5X12) **Max. Marks: 100**

Unit – I Cell Biology

Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma

Electron microscopic structure of animal cell.

Plasma membrane –Models and transport functions of plasma membrane.

.4Structure 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 Polygenes (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

Mutations & Mutagenesis

Chromosomal Disorders (Autosomal and Allosomal)

Human Genetics – Karyotyping, Pedigree Analysis (basics)

Basics on Genomics and Proteomics

UNIT IV: Molecular Biology

Central Dogma of Molecular Biology

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

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

Unit - V

Origin of life

Theories of Evolution: Lamarckism, Darwinism, Germ PlasmTheroy, Mutation Theory

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

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
- Karyotyping 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 tRNA and translation mechanism
- Power point presentation of transcription or any other topic by students
- Draw geological time scale and highlight important events along the time line

- 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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13. Molecular Biology by freifielder
14. Instant Notes in Molecular Biology by Bios scientific publishers and Viva Books Private Limited
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16. Campbell, N. A. and Reece J. B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.
17. Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
18. Minkoff, E. (1983). Evolutionary Biology. Addison-Wesley.
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21. Gupta P.K., „Genetics

ZOOLOGY MODEL PAPER FOR III SEMESTER

ZOOLOGY - PAPER - III

CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

Time : 3 hrs **Max. Marks : 75**

I. Answer any FIVE of the following : **5x5=25**

Draw labeled diagrams wherever necessary

1.

2.

3.

4.

5.

6.

7.

8.

II. Answer any FIVE of the following: **5x10=50**

Draw labeled diagrams wherever necessary

9.

OR

10.

OR

11.

OR

12.

OR

13.

OR

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ZOOLOGY PRACTICAL SYLLABUS FOR III SEMESTER

ZOOLOGY - PAPER - III

CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

Periods: 24 **Max. Marks: 50**

Learning Objectives:

- Acquainting and skill enhancement in the usage of laboratory microscope
- Hands-on experience of different phases of cell division by experimentation
- Develop skills on human karyotyping and identification of chromosomal disorders
- To apply the basic concept of inheritance for applied research
- To get familiar with phylogeny ad geological history of origin & evolution of animals

I. Cell Biology

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis and Meiosis with prepared slides
3. Mounting of salivary gland chromosomes of *Chiranomous*

II. Genetics

1. Study of Mendelian inheritance using suitable examples and problems
2. Problems on blood group inheritance and sex linked inheritance
3. Study of human karyotypes (Down‟s syndrome, Edwards, syndrome, Patau syndrome, Turner‟s syndrome and Klinefelter syndrome)

III. Evolution

1. Study of fossil evidences
2. Study of homology and analogy from suitable specimens and pictures
3. Phylogeny of horse with pictures
4. Study of Genetic Drift by using examples of Darwin‟s finches (pictures)
5. Visit to Natural History Museum and submission of report

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