Shiksha Mandal's

Bajaj College of Science, Wardha

(An Autonomous College)

Department of Zoology

Syllabus for B.Sc. Zoology (Semester Pattern)

Credit Based System

Academic Session 2022-23

(As per BOS 12-04-2022)

B.Sc. Semester IV

Paper IV - Genetics and Molecular Biology

UG-ZOO(07)-S4-T

UNIT – I **(12 Periods)**

1.1 Mendelian Principles: Mendel and his experiments with pea plant. Law of segregation: Monohybrid cross, back cross and test cross.Dominance and Recessive,Law of Independent Assortment: Dihybrid cross in Pea plant and Drosophila.

1.2 Interaction of genes- Chromosome theory of inheritance,Epistasis-dominant and recessive, codominance, incomplete dominance.

1.3 Linkage and crossing over – Chromosome theory of Linkage, kinds of linkage, mechanism of Meiotic Crossing over, significance of Crossing over.

1.4 Cytoplasmic inheritance- *Kappa* particles in *Paramecium*, CO_2 sensitivity in *Drosophila*,Extra nuclear inheritance: (mitochondria).

UNIT – II **(12 Periods)**

2.1 Chromosomal variation in Number: (Euploidy, Aneuploidy- Monosomes, Nullisomes and Trisomes) Disorders related to chromosomal number- Turner syndrome, Klinefelter syndrome and Down syndrome.

2.2 Chromosomal aberrations: Deletion, Duplication, Inversion, Translocation, Position Effect, Centromeric& Non-centromeric breaks in chromosomes. (Chronic Myeloid Leukemia (CML) and Burkitt's Lymphoma.

2.3 Introduction and Types of Gene mutations (Spontaneous and induced mutations) Base substitution, Frame shift mutation (insertion, deletion, missense, nonsense mutation)

2.4 Mutagens - Physical, chemical and biological.

UNIT – III **(12 Periods)**

3.1 Human karyotype,Classification of chromosomes based on position of centromere. Types of banding, and karyotype technique applications

3.2 Amniocentesis and it's applications with examples

3.3 Population genetics: Basic concepts in population genetics, Genetic Drift, Hardy Weinberg equilibrium and its significance

3.4 Ames test.

UNIT – IV **(12 Periods)**

(Introduction to Molecular biology)

4.1 Chemical Basis of Heredity: DNA as genetic material, Experiments of Griffith.

4.2 Watson and Crick model of DNA structure, Nucleoside and Nucleotide, Purines and Pyrimidines.

4.3 RNA types and structure (r RNA, mRNA, t RNA)

4.4 Fine structure of the Gene: Cistron, muton and recon.

UNIT – V **(12 Periods)**

5.1 Meselson– Stahl Experiment ,

5.2 DNA Replication in prokaryotes, proteins involve in DNA replication.Prokaryotic DNA polymerase.

5.3 Transcription in prokaryotes.

5.4 Genetic code: Nirenberg and Matthaei experiment, Properties of genetic code, Wobbles Hypothesis.

UNIT – VI **(12 Periods)**

6.1 Translation in Prokaryotes. (aminoacyl t RNA synthetase,Prokaryotic ribosomesand sites, activation of amino acids, transfer of activated amino acidsto tRNA Initiation ,30S initiation complex, 70S initiation complex, elongation and termination).

6.2 Eukaryotic vs. Prokaryotic gene structure.

6.3 Regulation of Gene expression in prokaryote. Repressor operator model of operon regulation, inducer, structure, positive and negative regulation in Lac Operon.

6.4 Tryptophanoperon – Structure, repressor, operator and attenuation mechanism of regulation in Trp operon.

Practical based on Genetics and Molecular Biology

UG-ZOO(07)-S4-P

Section A : Genetics –

1. Study of Monohybrid and Dihybrid ratio
2. Study of Normal Human Karyotype (Normal male and female)
3. Study of characters and Karyotypes of Syndrome like Down, Klinefelter& Turner
4. Field survey of Genetic traits in Human being and Submission of Diary
5. *Drosophila* culture: Media preparation and handling of flies
6. Study of *Drosophila* life cycle and its external morphology.
7. Study of *Drosophila* mutants.

Section B: Molecular Biology and Immunology

Molecular Biology :

1. Introduction to basic laboratory instruments and equipment's- Autoclave, pH meter, Electrophoresis apparatus; Molar and normal solutions calculations
2. Isolation of DNA (Genomic DNA from any available source) by phenol extraction method or any other method.
3. Quantification of Isolated DNA using Spectrophotometer.
4. Principles and Working of PCR.
5. Thin Layer Chromatography.

(Note: PCR and TLC has to be introduced as its basic technique required in research)

Distribution of Marks –		**Total Marks 30**
1.	Identification and comment on spots (2 Genetics, 2 Molecular Biology & Immunology)	04
2.	Experiment on Genetics	06
3.	Experiment on Molecular Biology & Immunology	06
4.	Submission of certified practical record	05
5.	Submission of Field diary	05
6.	Viva voce	04

Reference Books:

Genetics & Molecular Biology

1. Joshi - Genetics & Genetic Engineering
2. Joshi - Genetic Engineering & its applications
3. Gardener - Genetics
4. Winchester - Genetics
5. Gupta - Genetics
6. Sinnot Dunn, Dobzansy - Principles of Genetics
7. Ahluwalia - Genetics
8. Sarin - Genetics
9. Singleton - Elementary Genetics
10. Owen & Edger General Genetics
11. Alenberg - Genetics
12. Pai - Foundation of Genetics
13. Strickberger - Genetics
14. Veerbala Rastogi - T. B. of Genetics
15. Benjamin Lewis - Gene VI Oxford press
16. Benjamin Lewis - Gene VIII Oxford press
17. Pawar C. B. - Genetics Vol. I and II Himalaya publication

Molecular Biology

1. De Robertis- Cell and Molecular Biology , E. D. P., I. S. E. publication
2. Turner P. C. and McLennan - Molecular Biology, Viva Books Pvt. Ltd
3. Twyman R. M. - Advanced Molecular Biology, Viva Books Pvt. Ltd
4. Freifelder D. - Molecular Biology, narosa publication House
5. Watson J. D. - Molecular Biology of Gene, Benjamin publication
6. Darnell J. - Molecular Cell Biology Scientific American Books USA
7. Alberts B., Bray D. Lewis J. - Molecular Biology of the Cell, garland publishing Inc
8. Freifelder D. - Essentials of Molecular Biology, narosa publication House
9. Laodish H., Berk A., Zipursky S. L., Matsudaira P. Baltimore D. and Darnell J. - Molecular Cell Biology, W. H. Freeman and Co.
10. Upadhay A and Upadhay K - The Cell: Molecular Approch Molecular Biology, Himalaya publication
11. Bamrach - Molecular cell Biology
12. P.K. Gupta - Cell and Molecular Biology