

V SEMESTER B.Sc ZOOLOGY
PAPER VI: – GENETICS AND BIOTECHNOLOGY

		40hours
UNIT I		13 hrs
GENETICS		
1.1	Heredity and Environment: Concept of genotype, phenotype, phenocopy, Norm of reactions (Experiments on <i>Potentilla glandulosa</i> , Fur colour in Himalayan Rabbit, studies of Human twins).	02 hrs
1.2	Introduction to Mendelism: Mendelian principles- Law of segregation and Law of independent assortment.	02 hrs
1.3	Deviation from Mendelism:	08 hrs
	<ul style="list-style-type: none"> a. Multiple allelism (Ex: Inheritance of ABO blood groups), Rh factor and its inheritance, significance of Rh factor: Erythroblastosis foetalis. b. Interaction of genes: Inheritance of comb shape in poultry. c. Multiple factor inheritance: Inheritance of skin colour in man. d. Sex linkage: <ul style="list-style-type: none"> • X – linked inheritance, Eye colour in <i>Drosophila</i>, Colour blindness and Haemophilia. • Construction of pedigree charts for colour blindness and haemophilia. • Y – linked inheritance: Hypertrichosis in man. 	
1.4	Cytoplasmic inheritance: Kappa particles in <i>Paramecium</i> , Coiling of shells in snail.	01 hr
UNIT II		13 hrs
2.1	Giant chromosomes: Polytene and Lampbrush chromosomes.	02 hrs
2.2	<ul style="list-style-type: none"> a. Chromosomal basis of sex determination: Types with examples. b. Genic balance theory. c. Gynandromorphs and Free Martins. 	02 hrs
2.3	<ul style="list-style-type: none"> a. Numerical aneuploidy– Down’s syndrome, Cri du Chat syndrome, Turner’s syndrome and Klinefelter’s syndrome. b. Genetic diseases: Alcaptonuria, Albinism, Thalassaemia, Galactosemia and Cystic fibrosis. 	03 hrs
2.4	Concept of gene: Fine structure of gene: Cistron, Recon and Muton, Operon concept: Inducible Operon (E.g. Lac Operon)	01 hr
2.5	Gene mutations: Spontaneous and induced mutations, CIB method of detection of mutations, Physical, Chemical and Biological mutagens.	03 hrs
2.6	<ul style="list-style-type: none"> a. Eugenics: Definition, aspects of positive eugenics and negative eugenics. b. Euthenics and Euphenics. 	02 hrs
UNIT III		14 hrs
BIOTECHNOLOGY		
3.1	Genetic Engineering / Recombinant DNA (rDNA)Technology	04 hrs
	<ul style="list-style-type: none"> a. Molecular tools: Restriction enzymes, DNA ligases, Alkaline phosphatase. b. Vectors: Plasmids, Bacteriophages and Cosmids. c. Host cells: Prokaryotic hosts and Eukaryotic hosts. d. Bioreactors: Definition, types (mention) and applications. e. Methods of gene transfer: Microinjection, electroporation, of DNA, 	

	lipofection and direct transfer of DNA.	
3.2	Applications of Biotechnology:	
	a. Transgenesis:	01 hr
	i. Introduction – Meaning and significance.	
	ii. Transgenesis in mice, Knock out and Knock in technology.	
	b. Animal improvement:	02 hrs
	i. Super ovulation and embryo transfer: Steps, benefits and limitations of embryo transfer.	
	ii. Artificial insemination	02 hrs
	c. Gene therapy:	
	i. Somatic cell gene therapy, Embryo cell gene therapy and Germ cell gene therapy.	01 hr
	ii. In vivo and ex-vivo gene therapy.	01 hr
	d. Stem cells: Introduction, features, types, sources and applications	01 hr
	e. Hybridoma technology: Monoclonal antibodies and their applications.	
	f. DNA fingerprinting: Definition, steps involved and applications.	
3.3	PCR technique: Definition, steps involved and applications.	02 hrs
	RFLP, RAPD and AFLP: Definition and applications.	

References:-

1. Genetic Engineering by Sandhya Mitra(2015)
2. Gene cloning by Brown(2016)
3. Molecular biotechnology by Sathyanarayana U(2008)
4. Biotechnology by S.S. Purohith(2012)|
5. Transgenic animals by M.M.Ranga(2006)
6. Animal Biotechnology by M.M. Ranga(2007)
7. Molecular Biotechnology by Chennarayappa(2007)
8. Human Genetics by Mange and Mange(1993)
9. Principles of Genetics by Robert H Tamarin Ta Ta McGraw- Hill pub(2004).
10. Genetics by Monroe W. Strickberger , Mac Millan Pub(2008)

**V SEMESTER B.Sc., ZOOLOGY PRACTICAL - VI
PAPER – VI - GENETICS AND BIOTECHNOLOGY**

	15 Units
1. Drosophila Genetics:	04 Units
a. Sexual dimorphism and Mutant forms – Vestigial wing, White eye, Bar eye, Sepia eye, Yellow body and Ebony body.	
b. Mounting of Polytene chromosome (Salivary gland chromosome)	
c. Mounting of Sex comb and Genital plate.	
d. Genetic problems: Monohybrid cross, Dihybrid cross, multiple alleles, gene interaction	
e. Sex linkage (Construction of pedigree charts for colour blindness and haemophilia)	
2. Human Genetics:	04 Units
d. Blood typing	
e. Preparation of Buccal smear for sex chromatin	
f. Preparations of Blood smear for identification of cell types and comment on the types of leucocytes.	
3. Biotechnology:	03 Units
g. Staining and identification of Bacteria (Gram staining)	
h. Biochemical analysis to determine the interaction of bacteria with different substrates.	
i. Isolation of plasmid DNA	
4. Isolation of DNA from animal tissue.	01 Unit
5. Qualitative detection of acetic acid in Yeast culture (Student is required to prepare the culture)	01 Unit
6. Study of polyploidy in Onion root tip using Colchicine	01 Unit
7. Translocation in Rheo.	01 Unit

**SCHEME OF PRACTICAL EXAMINATION
V SEMESTER B.Sc ZOOLOGY
GENETICS AND BIOTECHNOLOGY: PRACTICAL - VI**

Duration: 3 hrs.

Max.Marks: 35

01.	Drosophila Genetics:	05 marks
	a) Identify and comment on A and B with neat labelled diagram: (Drosophila male/female/mutants- any two)	(2 _{1/2} +2 _{1/2})
	b) Mounting: Polytene Chromosome (Salivary Gland Chromosome) or Sex comb or Genital Plate.	07 marks
	or	
	Genetic problems (any two) (4+3 marks)	
02.	Human Genetics : from d to f (any one)	06 marks
03.	Biotechnology:	06 marks
	c) From g, h and i (any one)	06 marks
	d) From 5, 6, 7 and 8 (any one)	
04.	Class Records	05 marks
	Total	35 marks

