

Genetics

B.Sc.: Elective

Outlines of Tests

Paper	Title of Course	Marks
A	Principles of Genetics	50
B	Biochemistry and Quantitative Genetics,	50
C	Microbial and Molecular Genetics,	50
D	Genetics of Eukaryotes.	50
Total		200

Note:- Genetics as a separate subject should be introduced like Botany, Zoology and Chemistry etc. There will be followed four papers in the B.Sc. (Pass) for qualifying the subject of Genetics: 1) Principles of Genetics 2) Biochemistry and Quantitative Genetics, 3) Microbial and Molecular Genetics, 4) Genetics of Eukaryotes. Each paper will include 40 percent objective and 60 percent subjective. To keep the standard of education in case of subjective part question will have 2-3 parts.

Syllabi and Courses of Reading

PAPER-A: PRINCIPLES OF GENETICS

Marks: 50

Introduction of Genetics:	Heredity and variations.
Cell division:	Morphology and structure of Eukaryotic Chromosomes, Mitosis & Meiosis.
Mendelism:	Monohybrid, Di-hybrid, Tri-hybrid Crosses, Mendelian parameters and their locations.
Gene interaction:	Gene Interaction and lethality, Modifications of Mendelian ratios, Modifying gene and lethal genes.
Gene & environment:	Penetrance, Expressivity's Pleiotropism & Nurture. Phenocopies, Twin studies, Nature and
Linage & Crossing over:	Chromosome mapping crossing over, methodology of mapping, interference, coefficient of Coincidence.
Multiple alleles;	Blood groups
Sex linkage:	Sex chromosomes, Sex linked inheritance and Sex determination.

Practicals:

1. Problems related to Mendelian inheritance, Gene interaction, Gene mapping
2. Blood Groups-ABO blood groups and Rh Factors
3. Drosophila culture techniques.
4. Study of Mitosis & Meiosis, using Onion root tips and flower buds.

PAPER B: BIOMETRY AND QUANTITATIVE GENETICS

Marks: 50

Introduction:	Biological Variations & statistics, population & samples
Frequency distribution:	presentation of data in frequency tables, Histograms, frequency curve
Measures of central Tendencies:	Mean Medium and Mode
Measures of Dispersion (Spread):	Range, Mean deviation, Variance, standard deviation & standard error, coefficient of variation
Probabilities:	Mutually exclusive events and independent events, rules of combining Probabilities
Chi-square test:	Goodness of fit and test of associations
Quantitative genetics:	Polygenic inheritance, gene & genotypic frequencies, Hardy-Weinberg law, factors affecting gene frequencies

Practicals:

1. Collection of data
2. acquisition of random samples, graphical / tabular representation of data
3. problems related to combining probabilities, central tendencies and dispersion
4. problems related to chi-square
5. problems of goodness of fit and independent events
6. verification of genetic ratios and test of association
7. problems of gene genotype frequencies
8. problems related to polygenic inheritance

PAPER C: MOLECULAR AND MICROBIAL GENETICS**Marks: 50**

Prokaryotes & eukaryotes:	Difference and uniformity
Life cycles:	Bacteria, Virus, Yeast & Neurospora
Tetrad analysis:	Yeast (unordered and neurospora (ordered))
Nucleic acid as Genetic	Griffith's experiment, Macleod & Macarty,
Material:	Hershey, Chase & Frankin & Conral's Experiments
Structure of nucleic acids	DNA & RNA, DNA replication and its kinds
Mutations:	Types, Mutagens, molecular basis of mutation
Genetic code:	genetic code and its properties
Transcription & Translation:	stages and processes
Recombination in bacteria:	Transformation, Conjugation and Transduction
Recombinant DNA Techniques:	Introduction to recombinant DNA technology

Practicals:

1. Precautionary measures
2. Sterilization techniques
3. Bacterial culture techniques, solid & liquid media
4. Gram's staining of bacterial culture
5. Study of colonial & cellular morphology of bacteria
6. Counting of cells in culture
7. Yeast culture techniques
8. Staining of Yeast

PAPER D: GENETICS OF EUKARYOTES**Marks: 50**

Human Genetics	Human genome, Pedigree analysis, Genetic Diseases' & disorders, Genetic Counseling
Plant Breeding and Genetics	Principles and methods, Outbreeding and Inbreeding, Methods of crop improvement; Selection, Hybridization, Introduction and Acclimatization and Mutation Breeding Transgenic plants. Arabidopsis genome.
Animal Breeding and Genetics	Methods of animal breeding, Selection methods animal breeding, Selection Outbreeding, Transgenic animals. Use of recombinant, DNA techniques, Artificial insemination, Embryo Transplantation, Heterosis.

Practicals:

1. Visit of live stock/ poultry farms and report writing.
2. Visit to agriculture research institutions.
3. Candling of eggs.
4. Human Karyotyping from photographs and prepared slides.
5. Problems relating to human pedigree analysis.

6. Emasculation and crossing techniques.

Recommended Books

1. Strickberger M.W., Genetics, Third Edition. Macmillan Publishing, N.Y. London, 1985.
2. Tararhin Rober H., Principles of Genetics, Seventh Edition. MacGraw-hill Higher Education North America, 2002.
3. Zar J.H. Biostatistical Analysis, Fourth edition, Prentice Hall Co. 1998.
4. Adolph K.w., Microbial Gene Techniques (Methods in Molecular Genetics, Vol.6) Academic Pr; 1995.
5. Streips U.N., R.E. Yasbin, Modern Microbial Genetics 2nd edition.
6. Khan, M.A. E. Bashir and R. Bantel Plant Breedinng, National Book Foundation, Islamabad, 1994.
7. Lewis R. Human Genetics. MacGraw Hill Co. Inc. N.Y, USA, 1999.
8. Bourdob, R.W. Understanding Animal Breeding, Prentic Hall Inc. New Jersey USA, 2000.