

NEHRU GRAM BHARATI VISHWAVIDYALAYA

**KOTWA- JAMUNIPUR- DUBAWAL
ALLAHABAD (UTTAR PRADESH)**



SYLLABUS

For the

B.Sc. – ZOOLOGY

(A Three Years Course)

B.Sc. - First Year Zoology

Paper - I	:	Diversity of Life - I (Non Chordates)	34 Marks
Paper - II	:	Genetics, Taxonomy & Evolution	33 Marks
Paper - III	:	Cell Biology, Endocrinology and Biochemistry	33 Marks
Practical			50 Marks

B.Sc. - Second Year Zoology

Paper - I	:	Diversity of Life - II (Chordates) & Comparative anatomy	34 Marks
Paper - II	:	Animal Physiology & Immunology	33 Marks
Paper - III	:	Ecology, Wildlife Management & Biostatistics	33 Marks
Practical			50 Marks

B.Sc. - Third Year Zoology

Paper - I	:	Economic Zoology & Ethology	50 Marks
Paper - II	:	Environmental Biology & Instrumentation	50 Marks
Paper - III	:	Molecular Biology, Genetic Engineering, Tissue culture & Environmental Biotechnology	50 Marks
Practical			75 Marks

Pattern of theory papers & allocation of marks

1. B.Sc. I (Three papers)

- **Paper-I** - **34 Marks**
- Divided into 3 parts, **Total no. of questions – 11**
 - **Part 1:** Question 1(Compulsory) – **9 marks** (9 Objective / Very short answer questions)
 - **Part 2:** Section A – **Six Questions from Unit 1, 2 & 3** (Question 2 - 7)
(Students have to **attempt any three**), Each question Carries 5 Marks
 - **Part 3:** Section B - **Four Questions from Unit 4 & 5** (Question 8 - 11)
(Students have to **attempt any two**), Each question Carries 5 Marks
- **Paper-II & III** - **33 Marks**
- Divided into 3 parts, **Total no. of questions – 11**
 - **Part 1:** Question 1(Compulsory) – **8 marks** (8 Objective / Very short answer ques)
 - **Part 2:** Section A – **Six Questions from Unit 1, 2 & 3** (Question 2 - 7)
(Students have to **attempt any three**), Each question Carries 5 Marks
 - **Part 3:** Section B - **Four Questions from Unit 4 & 5** (Question 8 - 11)
(Students have to **attempt any two**), Each question Carries 5 Marks

2. B.Sc. II (Three papers) – (Pattern similar to B.Sc. I)

- **Paper-I** - **34 Marks**
- Divided into 3 parts, **Total no. of questions – 11**
 - **Part 1:** Question 1(Compulsory) – **9 marks** (9 Objective / Very short answer ques)
 - **Part 2:** Section A – **Six Questions from Unit 1, 2 & 3** (Question 2 - 7)
(Students have to **attempt any three**), Each question Carries 5 Marks
 - **Part 3:** Section B - **Four Questions from Unit 4 & 5** (Question 8 - 11)
(Students have to **attempt any two**), Each question Carries 5 Marks
- **Paper-II & III** - **33 Marks**
- Divided into 3 parts, **Total no. of questions – 11**
 - **Part 1:** Question 1(Compulsory) – **8 marks** (8 Objective / Very short answer ques)
 - **Part 2:** Section A – **Six Questions from Unit 1, 2 & 3** (Question 2 - 7)
(Students have to **attempt any three**), Each question Carries 5 Marks
 - **Part 3:** Section B - **Four Questions from Unit 4 & 5** (Question 8 - 11)
(Students have to **attempt any two**), Each question Carries 5 Marks

3. B.Sc. III (Three papers)

- **Paper-I, II & III** - **50 Marks**
- Divided into 3 parts, **Total no. of questions – 11**
 - **Part 1:** Question 1(Compulsory) – **10 marks** (10 Objective/Very short answer ques)
 - **Part 2:** Section A – **Six Questions from Unit 1, 2 & 3** (Question 2 - 7)
(Students have to **attempt any three**), Each question Carries 8 Marks
 - **Part 3:** Section B - **Four Questions from Unit 4 & 5** (Question 8 - 11)
(Students have to **attempt any two**), Each question Carries 8 Marks

B.Sc. - First Year

Zoology

FIRST PAPER

Diversity of Life - I (Non-Chordates)

Unit - 1

General Classification of non-chordate phyla upto classes. Functional morphology of type forms.

Protozoa - Type study: Trypanosoma, Plasmodium, Paramecium

Unit - 2

Porifera - Type study: Sycon (Scypha)
Canal system in sponges, cell types, spicules

Cnidaria - Type study: Obelia, Aurelia.
Polymorphism, Coral reefs.

Ctenophora - Affinities.

Unit - 3

Platyhelminthes - Type study: Echinococcus.
Parasitic adaptations in helminths.

Aschelminthes - Type study: Wuchereria bancrofti

Annelida - Type study: Nereis.
Metamerism and Trochophore.

Unit - 4

Arthropoda - Type study: Prawn (Palaeomon).
Insect Metmorphosis.

Mollusca - Type study: Unio, Pila.
Torsion in Gastropods.

Unit - 5

Echinodermata - Type study: Asterias.
Water vascular system.

Hemichordata - Type study: Balanoglossus and its affinities.

References:

1. Parker, Haswell and Williams - Text book of Zoology (Non Chordata) Vol. I A.Z. T.B.S. Publisher and Distributor.
2. Nigam H.C. - Zoology of Non Chordate, Vishal Publication
3. Hyman, L.H. - The Invertebrate (Vol 1 to 6.)
4. Kotpal R.L. - A text book of Invertebrate, Rastogi Publication
5. P.S. Verma - Invertebrate Practical
6. S.S. Lal - Invertebrate Practical.
7. Asthana, Agrawal and Jindal - Invertebrate practical.

SECOND PAPER

Section-A: Genetics

Unit - 1

- Elements of Heredity and Variation.
- Mendel's Laws of inheritance. Linkage.
- Sex linked inheritance.
- Sex determination in Human and Drosophila. Dosage compensation.

Unit - 2

- Human and applied genetics (Pedigree analysis)
- Cytoplasmic or maternal inheritance.
- Blood Groups.

Unit - 3

- Nucleic Acids.
- Nucleic acids as genetic material (Hershey & Chase exp., Fraenkel & Conrat exp.)
- Gene mutation and its molecular basis.

Section-B: Taxonomy and Evolution

Unit -4: Taxonomy

- Principal of taxonomy and hierarchy
- International code of Zoological Nomenclature
- Numerical taxonomy – Meristic and non-meristic data
- Molecular taxonomy
- Chemical taxonomy

Unit -5: Evolution

- Origin of life; Theories of evolution
- Natural selection
- Mutation
- Genetic drift
- Isolation
- Speciation
- Mimicry

References:

1. Lewis C.D. and Levin, R.: Biology of gene, Mc. Grew Hill - Toppan Co. Ltd.
2. Gardener : Principles of Genetics, Willey Eastern Pvt. Ltd.
3. Strickberger : Genetics, Macmillan Publications.
4. Enderson : Genetics.
5. Verma P.S. and J.K. Agarwal: Genetics, S. Chand and Co.
6. Gupta P.K. : Genetics, Rastogi Publications
7. Moody : Introduction to Evolution (Indian Edition).
8. Savage : Evolution (Holt, Reimhart and Winston)
9. Strickberger : Evolution.
10. Colbert : Introduction to vertebrate evolution.
11. Dobzhansky : Evolution (W.H. Freeman)

THIRD PAPER
Section A: Cell Biology and Endocrinology

Unit -1

- Introduction of Cell, Ultra structure & function.
- Eukaryotic and prokaryotic cell.

Unit - 2

- Cell theory
- Cell organelles (Mitochondria, Golgi bodies, Endoplasmic Reticulum, Lysosomes, Centrosome)
- Cell cycle & cell division (Mitosis and Meiosis)

Unit – 3

- Hormones and endocrine glands (structure, histology)
- Types and mode of actions in hormones
- Gametogenesis and hormonal control: Spermatogenesis, oogenesis, menstrual cycle
- Endocrine (Hormonal) disorders

Section B: Biochemistry

Unit -4

- Biomolecules (Proteins, Carbohydrates and fats): Structure & Classification
- Glycolysis
- Kreb's Cycle
- Oxidative phosphorylation, Electron transport system
- Gluconeogenesis, Cori's cycle
- Fatty acid synthesis
- Urea cycle

Unit -5

- Enzymes: Nature, Properties, Classification, action; co-enzyme; isozyme; abzyme; ribozyme; co-factors.
- Vitamins: Classification, Importance and Sources.

References:

1. Harper's Review of Biochemistry.
2. Voet and Voet, Biochemistry William and sons, John Wiley & Sons.
3. Stryer L. – Biochemistry (Fifth edition)
4. Nelson & Cox - Lehninger's Biochemistry CBS
5. Robertes & Robertes - Cell & Molecular Biology.
6. Verma P.S. & Agarwal - Cell Biology.
7. Gupta P.K. - Cytology.
8. Lodish, H.et.al. - Molecular cell biology.
9. Alberts, B. et. al - Molecular Biology of the cell (Garland)
10. Karp G. - Molecular Cell Biology.
11. Baynara & Turner : General Endocrinology (W.B. Saunder's)
12. Saidpur, S.K. : Reproductive cycles.
13. Gorbamn, A & Burn H.A.: A text book of comparative endocrinology (Willey Eastern).
14. Yadav J.S. : Endocrinology

Practicals

Major Dissection	10
Minor Dissection	05
Genetic Exercise	05
Cytological Exercise	05
Biochemical test	05
Comments on spots from 1-10	10
Viva-voce test and practical record	10
	50

Contents of Practical:

Study of Museum Specimens and slides relevant to the type studies in theory:

1. Museum Specimens:

Porifera	:	<u>Leucosolenia</u> , <u>Sycon</u> , <u>Grantia</u> , <u>Ciona</u> , <u>Spongilla</u> , <u>Euspongia</u> .
Cnidaria	:	<u>Physalia</u> , <u>Millipora</u> , <u>Aurelia</u> , <u>Rhizostoma</u> , <u>Alcyonium</u> , <u>Tubipora</u> , <u>Gorgonia</u> , <u>Pteroids</u> , <u>Adamsia</u> , <u>Madrepora</u> , <u>Fungia</u>
Platyhelminthes	:	<u>Planaria</u> , <u>Fasciola</u> , <u>Taenia solium</u> .
Aschelminthes	:	<u>Ascaris</u> , (Male & Female).
Annelida	:	<u>Nereis</u> , <u>Heteroneries</u> , <u>Aphrodite</u> , <u>Chaetopterus</u> , <u>Pontobdella</u> .
Mollusca	:	<u>Chiton</u> , <u>Dentalium</u> , <u>Patella</u> , <u>Aplysia</u> , <u>Doris</u> , <u>Pecten</u> , <u>Pinctada</u> , <u>Teredo</u> , <u>Loligo</u> , <u>Sepia</u> , <u>Octopus</u> , <u>Nautilus</u> .
Arthropoda	:	<u>Lepus</u> , <u>Balanus</u> , <u>Sacculina</u> , <u>Mysis</u> , <u>Eupagurus</u> , <u>Limulus</u> , <u>Julus</u> , <u>Scolopendra</u> , <u>Lepisma</u> .
Echinodermata	:	<u>Astropecten</u> , <u>Clypeaster</u> , <u>Holothuria</u> , <u>Antidon</u> .

2. Permanent Slides:

Protozoa	:	<u>Euglena</u> , <u>Paramecium</u> , W.M. Binary Fission, Conjugation in <u>Paramecium</u> , <u>Monocystis</u> , <u>Plasmodium</u> , <u>Opalina</u> , <u>Balantidium</u> , <u>Entamoeba</u> , <u>Leishmania</u> .
Porifera	:	Spongin fibres, gemmule, spicules, L.S. & T.S. of <u>Sycon</u> .
Coelenterata (Cnidaria)	:	T.S. of Hydra through gonads, <u>Obelia</u> W.M., <u>Obelia</u> medusae, Ephydra Larva.
Helminthes	:	<u>Fasciola</u> through testes; Scolex, mature and gravid proglottid of <u>Taenia solium</u> , Miracidium, Redia, Cercaria, Metacercaria, Cysticercus larva.
Annelida	:	T.S. <u>Nereis</u> , parapodium of nereis and heteronereis, trochophore larva, T.S. of Leech through Crop.
Arthropoda	:	Megalopa, Mysis, Zoea, Nauplius, Daphnia, Cyclopes, Mouthparts of male and female <u>Culex</u> and <u>Anopheles</u> , <u>Pediculus</u> W.M., <u>Cimex</u> W.M.
Echinodermata	:	T.S. of arm of starfish, pedicellaria, bipinnaria larva.
Hemichordata	:	T.S. of <u>Balanoglossus</u> through anterior and branchiogenital regions.

3. Dissections:

Palaeomon (Prawn) - Appendages and nervous system.

Unio & Pila - External features, General anatomy and nervous system.

4. Mounting:

Gemmule, Parapodium of Nereis, Gill of Pila & Unio, Statocyst of Prawn, spermathecae, nephridium and ovary of Earthworm.

5. Genetics:

Problems on monohybrid, dihybrid crosses, back cross, blood groups, sex linked diseases and pedigree exercises.

6. Cytology:

Study of various stages of mitosis and meiosis. Slide preparation of onion root tip and grasshopper testis. Preparation of slides for Mitochondria and Barr body.

7. Biochemical tests:

Test for Carbohydrate (Glucose and Starch), Protein, Fats/Lipids.

References:

- | | |
|--------------------------------|-------------------------------------|
| 1. Genetics | - P.K. Gupta, Rastogi Publications. |
| 2. Invertebrate Practical | - P.S. Verma |
| 3. Invertebrate Practical | - S.S. Lal |
| 4. Verma P.S., P.C. Srivastava | - Practical Zoology, S. Chand & Co. |

B.Sc. - Second Year Zoology

FIRST PAPER

Section A: Diversity of Life - II (Chordates)

General classification of chordates upto orders. Functional morphology of type forms.

Unit -1

Protochordata - Type study: Herdmania, Branchiostoma

Unit -2

Agnatha - Type study: Petromyzon

Pisces - Type study: Scoliodon

Amphibia - Neoteny, parental care.

Unit -3

Reptilia - Sphenodon: a living fossil; Poisonous & non poisonous snakes, Snake biting mechanism.

Birds (Aves) - Flight adaptations, migration.

Mammals - Egg laying mammals, aquatic mammals.

Section B: Comparative Anatomy

Comparative anatomy of vertebrates with reference to following:

Unit -4 Circulatory system, Integumentary system.

Unit -5 Urino-genital system, Nervous system with special reference to brain.

References:

1. Romer - The life of Vertebrates.
2. Colbert - Introduction to Vertebrate Evolution.
3. Parker & Haswel - Book of Zoology (Volume II), (Chordata).
CBS Publishers
4. Yong J.Z. - Life of Vertebrates, ELBS
5. Nigam H.C. - Zoology of Chordates, Vishal Publications,
Jalandhar.
6. Kotpal R.L. - Text book of vertebrates, Rastogi Publications.
7. Chapman G. & Baker, W.B. - Zoology, Longmans Greens, London.
8. Prasad S. N. & Kashyap V. - A Textbook of Vertebrate Zoology, (New Age)

SECOND PAPER

Section A: Animal Physiology

Unit -1

- Physiology of digestion.
- Physiology of circulation.

Unit -2

- Physiology of respiration.
- Physiology of excretion.

Unit -3

- Solutions, Osmotic Pressure, diffusion, active and passive transport, pK and pH, buffers.
- Mechanism of neuromuscular co-ordination.
- Homeostasis.

Section B: Immunology

Unit -4

- An Introduction to cellular basis of Immunity.
- Immunity: Inborn and Acquired (Active & Passive immunity).
- Antigens: Types, characteristics, Antigen Presenting cells.

Unit -5

- Antibody: Types, Structure, properties.
- Antigen - Antibody reaction.
- MHC Molecules.
- Humoral and Cell mediated response
- Immune disorder: AIDS.

References:

1. Wood D.W. : Principles of Animal Physiology
2. Eckert and Randell : Animal Physiology CBS
3. Guyton A.C. : Medical Physiology
4. Berry A.K. : Animal Physiology
5. Srivastava, Agrawal and Kumar : Animal Physiology
6. Kubey : Immunology
7. Instant notes of Immunology
8. Samson Wright : Applied Physiology, Oxford Medical Publications
9. Chaudhuri S. K. : Concise Medical Physiology

THIRD PAPER
Section A: Ecology and Wild Life Management

Unit -1

- Ecology: Definition, aim & scope.
- Ecological factors.
- Adaptation: Definition, types with adaptive features and examples.

Unit -2

- Definition and types of ecosystem.
- Energy flow in ecosystem, food chain, food web.
- Biogeochemical cycles.
- Ecological pyramids and ecological succession.

Unit -3

- Population interactions: Intra and interspecific.
- Community- Definition and characteristics.
- Wild Life in India: Endangered flora and fauna of India, Wild life management.
- Wild life conservation (*in-situ* and *ex-situ*): Zoos, National Parks, Sanctuaries and biosphere reserves.

Section B: Biostatistics

Unit -4

- Measure of central tendency (Mean, Median, Mode).
- Data analysis and distribution.

Unit -5

- Coefficient of correlation.
- Student's t – test.
- Chi-square.
- Null hypothesis.

References:

1. Odum : Fundamental of Ecology (W.B. Saunders)
2. Odum : Ecology (Amerind)
3. Ricklefy : Ecology (W.H. Freeman)
4. Willimer, P.G. Stone and John Stone : Environmental Physiology
(Blackwell Sci. Oxford 4K)
5. Singh H.R. : Ecology & Environmental Science.
6. Sharma P.D.: Environmental Biology and toxicology.
7. Arora P.N., P.K. Malhan: Biostatistics, Himalaya Publishing House.
8. Prasad S.G. : Biostatistics.

Practicals

Major Dissection	10
Minor Dissection	05
Physiological Exercise	05
Ecological Exercise	05
Adaptation/immunology	05
Comments on spots from 1-10	10
Viva-voce test and practical record	10
	50

Contents of Practical:

Study of Museum Specimens and slides relevant to the type studies in theory:

1. Museum Speciation

Protochordata	:	<u>Herdmania</u> , <u>Amphioxus</u>
Cyclostomes	:	<u>Petromyzon</u> , <u>Ammocoete larva</u> , <u>Myxine</u>
Pisces	:	<u>Trygon</u> , <u>Pristis</u> , <u>Torpedo</u> , <u>Protopterus</u> , <u>Hilsa</u> , <u>Labeo</u> , <u>Wallago</u> , <u>Exocoetus</u> , <u>Hippocampus</u> , <u>Anabas</u> , <u>Chiemera</u> , <u>Diodon</u> , <u>Synaptura</u> , <u>Echeneis</u> , <u>Tetradon</u>
Amphibia	:	<u>Ichthyophis</u> , <u>Ambystoma</u> , Axolotal larva, <u>Salamendra</u> , <u>Amphiuma</u> , <u>Proteus</u> , <u>Siren</u> , <u>Alytes</u> , <u>Pipa</u> , <u>Hila</u>
Reptilia	:	<u>Chelone</u> , <u>Testudo</u> , <u>Sphenodon</u> , <u>Chaemeleon</u> , <u>Phrynosoma</u> , <u>Draco</u> , <u>Iguana</u> , <u>Haloderma</u> , <u>Typhlops</u> , <u>Python</u> , <u>Bangarus</u> , <u>Naja</u> , <u>Hydrophis</u> , <u>Viper</u> , <u>Natrix</u> , <u>Crotalus</u>
Aves	:	<u>Pigeon</u> , <u>Fowl</u> , <u>Chick</u> , W.M. Flight Feather
Mammals	:	<u>Hedgehog</u> , <u>Manis</u> , <u>Hystrix</u> , <u>Bat</u>

2. Permanent Slides

Protochordata	:	W.M. <u>Salpa</u> , <u>Doliolum</u> , T.S. of <u>Amphioxus</u> , Spicules of <u>Herdmania</u> .
Amphibia	:	V.S. of Skin, T.S. through alimentary canal, C.S. of Liver, C.S. of Lung, T.S. of Kidney, T.S. of gonads.
Aves	:	W.M. of filoplumes, W.M. of down feather
Mammals	:	V.L.S. through Skin, T.S. of Liver, T.S. of Lung, T.S. of Kidney, T.S. of Gonads.

3. Dissection- Scoliodon : Afferent and efferent arterial system.
Cranial nerves, Internal ear.

4. Osteology : Study of Endoskeleton of the following:
Frog, Varanus, Fowl, Rabbit.

5. Mounting:

<u>Scoliodon</u>	:	Ampulla of Lorenzini, Placoid scales.
<u>Frog</u>	:	Striated and unstriated muscles.

6. Physiology:

Estimation of Haemoglobin, Counting of RBC and WBC in Human Blood, Preparation of Hemin Crystals, Preparation of blood film of frog.

7. Ecological Exercise:

Study of Physio-chemical factors (temperature, pH, salinity and light) and properties of water (turbidity, hardness, CO₂, acidity, alkalinity), ecological apparatus.

8. Adaptation:

Adaptive features of animals in relation to their habit and habitat: Synaptura, Exocoetus, Axoltle larva, Chameleon, Phrynosoma, Hedgehog, Bat.

9. Immunology:

Preparation of Blood Film from the blood of animal provided. Leishman's Staining to localize lymphocytes and other leucocytes. Structural knowledge of antibodies (IgG, IgM, IgA). Blood group detection with Rh factor.

References:

- | | | |
|-------------------------|---|---|
| 1. Practical Zoology | - | Robert William Hegner |
| 2. Vertebrate Practical | - | P.S. Verma |
| 3. Vertebrate Practical | - | S.S. Lal |
| 4. Vertebrate Practical | - | Asthana, Agrawal and Jindal, Pragati
Prakashan |
| 5. Vertebrate Practical | - | O.P. Saxena |

B.Sc. - Third Year Zoology

FIRST PAPER Section A: Economic Zoology

Unit -1

- Protozoa and human diseases.
- Diseases caused by ticks and mites.

Unit -2

- Apiculture
- Sericulture
- Lac culture.
- Prawn culture
- Pearl culture

Unit -3

- Plant & Stored grain pests.
- Biological control of pest; Integrated Pest Management.
- Pisciculture

Section B: Ethology

Unit -4

- Definition and scope of Ethology.
- Methods used in ethological studies.
- Patterns of Behaviour, Courtship Behaviour
- Migratory behaviour in fish.

Unit -5

- Socialism in animals.
- Learning, Motivation, Imprinting.
- Role of hormones in behaviour.

References:

1. Shukla Upadhyay - Economic Zoology, Rastogi Publication, Meerut.
2. Srivastava - Text book of Applied Entomology.
3. Venkatraman - Economic Zoology
4. Mathur Reena - Animal Behaviour, S.Chand & Co.
5. Mannings - Ethology
6. Gundevia H.S. and Hargovind - Animal Behaviour.
7. Lucas J. R. and Simmons L. W. - Essays in Animal Behaviour

SECOND PAPER

Section A: Environmental Biology

Unit - 1 :

- Environmental Pollution - Water, air, soil and noise pollution.
- Greenhouse effect & global warming, acid rain, ozone layer depletion.
- Conventional and non-conventional sources of energy.

Unit - 2 :

- Environment & human health: Environmental Health; Water quality & water borne diseases; Environmental hazards of radiations and safety measures.
- Environmental monitoring - Concept & Tools.
- Environmental Impact Assessment.
- Bioindicators.

Unit - 3 :

- Biodiversity: Concept, types and values; Hotspots; Threats to biodiversity.
- Biodegradation, Biomagnification and Bioremediation.
- Solid waste management: Causes, effects and control.

Section B: Instrumentation

Unit- 4 :

- Principles and applications of pH meter, spectrophotometer, centrifuge.
- Microscopy: Compound microscopy, Phase-Contrast microscope, Electron microscopy (TEM, SEM)

Unit- 5 :

- Microtomy: Paraffin embedding of tissues, cutting of sections & processing.
- Chromatography (Paper and TLC).
- Electrophoresis.

References:

1. Willimer, P.G. Stone and John Stone : Environmental Physiology (Blackwell Sci. Oxford 4K)
2. Singh H.R. - Ecology & Environmental Science.
3. Sharma P.D. - Environmental Biology and toxicology.
4. Introduction to instrumental analysis - Robert Brown, Mc.Graw Hill, International Edition.
5. Bisen B.S., Techniques in Life Sciences.
6. Taylor, Green, Stout - Biological Sciences, Cambridge Low Prize Editions.
7. Gupta P.K. - Cytology.
8. Gyton – Cytology
9. Rana S. V. S. - Bio-techniques: Theory & Practice (Rastogi publications)
10. Bharucha E. – Textbook of Environmental Studies (University Press).

THIRD PAPER

Molecular Biology, Genetic Engineering, Tissue culture & Environmental Biotechnology

Unit-1

- Central dogma of life: Concept of gene expression; Reverse transcription; Split gene.
- Structure & function of DNA (Types, Double helical model, nucleosome organization) & RNA (Types, Clover leaf model of t-RNA); Transposons.

Unit -2

- Replication of DNA, Transcription and post-transcriptional modifications, Translation, Protein sorting, packaging and transport.
- Regulation of gene expression in prokaryotes (Operon model).

Unit-3

- Genetic engineering- Aims and scope, Restriction enzymes, Cloning vectors.
- Gene Cloning & Gene Library.
- Applications of Genetic engineering: Transgenic animals, Edible vaccines, gene therapy.
- DNA finger and foot printing.

Unit-4

- Tissue culture- Introduction, cell culture, organ culture, hybridoma technology.
- Animal cloning, PCR.
- Bioinformatics- Introduction and applications.

Unit-5

- Xenobiotics
- Microbial degradation of pollutants
- Industrial Bioreactors
- Bioplastics

References:

1. Singh B.D.: Biotechnology (Kalyani Pub.)
2. Mayers R.A.: Molecular Biology and Biotechnology.
3. Genetic Engineering - Principles and Methods (Vol 27) - J. Setlow, ed., (Springer, 2006)
4. Alfred Pingoud – Restriction Endonucleases, Springer Verlag Berlin Heidelberg New York
5. Lodish et al - Molecular Cell Biology 5th ed
6. Reilly O. – Beginning Perl For Bioinformatics
7. Watson, J.D - Molecular Biology of the Gene
8. Lesk Arthur M. - Introduction to Bioinformatics

Practicals

Microtomy and Mounting	10 (5+5)
Chromatography (Paper)	10
Environmental Biology	10
Biotechnology	05
Economic Zoology (1 insect life cycle + 1 plant or stored grain pest)	10 (5+5)
Seminar	10
Project on Ethology	10
Viva and record	10
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	75
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Contents of Practical:

- 1. Microtomy** : Fixation of Organs (Lung, Liver, Kidney, Gonads) of dissected Rat/Frog. Paraffin block preparation, section 'cutting, stretching. Double staining, Mounting
- 2. Paper chromatography** : Pigment separation from Spinach extract, R_f calculation for Amino acids.
- 3. Environmental biology** : Pond water analysis, Estimation of water quality & DO, comments upon the Apparatus related with environmental assessment.
- 4. Biotechnology** : Molecular Worksheet, Model preparation of DNA, RNA and Proteins
- 5. Economic Zoology** : Comments upon the life cycle of Bombyx, Apis, Lacifer.
Comments upon the life cycle and morphology of major crop and stored grain pests.
- 6. Seminar** : Oral presentation on any biological topic for 10 minutes.
- 7. Ethology Project** : Preparation of Project report based on behavioural observations of any animal. Reports should have sub categories as Acknowledgement; Introduction & Objectives; Methods; Observations; Results; Discussion and Bibliography.

References:

1. Practical Zoology - Robert William Hegner
2. Advanced Practical In Zoology - S.S. Lal
3. Practical Zoology - S.S. Lal
4. Practical Zoology - P.S. Verma and P.C. Srivastava
5. Bio-techniques: Theory & Practice - S. V. S. Rana (Rastogi publications)