EWING CHRISTIAN COLLEGE
PRAYAGRAJ

(An Autonomous Constituent P.G. College of Allahabad University)

DEPARTMENT OF ZOOLOGY

Syllabus of B.Sc.

SEMESTER- I

Paper I (1ZOOTH1)
(MICROSCOPY, CELL BIOLOGY, PROTOZOA AND PORIFERA)

UNIT- I

A. Microscopy:

(i) Principles of Microscopy
   a. Magnification
   b. Resolving Power

(ii) Light Microscopes:
   a. Simple Microscope.
   b. Compound Microscope.
   c. Binocular Microscope.
   d. Phase Contrast Microscope.

(iii) Electron Microscope (E.M.)
   a. Principles of Electron Microscopy.
   b. Working of:
      1. Transmission Electron Microscope (TEM)
      2. Scanning Electron Microscope (SEM)

Unit-II

B. Cell Biology:

(i) Structure of Plasma Membrane (Fluid Mosaic Model), Passive and Active Transport across the Membrane (Na^+ - K^+ pump)

(ii) Structure and functions of:

a. Golgi Apparatus
b. Endoplasmic Reticulum
c. Ribosomes
d. Lysosomes
e. Mitochondria

(iii) Cytoskeletal structures: Cilia and Flagella

(iv) Structure and functions of Nucleus, Nuclear membrane, Nucleolus and Nuclear pore complex.

(v) Structure of eukaryotic chromosome (Nucleosome model).

(vi) Polytene and Lampbrush chromosomes.

Unit-III

C. Protozoa

(i) General characters and Classification up to orders with examples

(ii) Type study:

a. *Paramecium*
   1. Morphology
   2. Reproduction
b. Free living protozoa: *Euglena.*

Unit-IV

D. Porifera

(i) General characters and Classification up to orders with examples.

(ii) Type study: *Sycon*

a. Morphology
b. Life cycle

(ii) Canal system in Porifera.

Paper II (1ZOOTH2)

(CTENOPHORA, COELENTERATA, PLATYHELMINTHES, ASCHELMINTHES AND ANNELIDA)

UNIT I

A. Ctenophora

(i) General characters and Classification up to orders with examples.

(ii) Comparison with Coelenterate and its position in Animal Kingdom.

(iii) Type study—

Pleurobrachia (External features only).

B. Coelenterata

(i) General characters and Classification up to orders with examples.

(ii) Type Study:

Obelia, Alternation of generationin *Obelia*

UNIT II

C. Platyhelminthes

(i) General characters and Classification up to orders with examples.

(ii) Type study

a.*Planaria (Dugesia)*

1. Morphology
2. Regeneration, Heteromorph
3. Asexual and sexual reproduction & development

b.*Fasciola hepatica:*

1. Morphology
2. Reproduction, life history and development

c. *Echinococcus*

1. Morphology
2. Reproduction, life history and development

Unit III

D. Aschelminthes

(i) General characters and Classification up to orders with examples.

(ii) Type study: *Ancylostoma.*

a. Morphology

b. Reproduction, life history and development

UNIT IV

E. Annelida

(i) General characters and Classification up to orders with examples.

(ii) Type Study :*Hirudinaria* (Indian Cattle Leech)

a. Morphology, body wall, locomotion.

b. Alimentary canal, feeding and digestion.

c. Haemocoelomic system, course of circulation.

d. Respiration

e. Excretory system

f. Nervous system, Sense organs and receptors organs.

g. Reproductive system

SEMESTER—II

Paper I (2ZOOTH1)

(ONYCHOPHORA, ARTHROPODA, MOLLUSCA AND ECHINODERMATA)

UNIT I

A. Onychophora

(i) General characters and affinities of *Peripatus*

UNIT II

B. Arthropoda

(i) General characters and Classification up to orders with examples

(ii) Type study: .

a. *Apis* (Honey Bee):

1. Morphology
2. Different castes in honey bees.
3. Reproduction
4. Economic importance

b. *Palaemon* (Prawn)

1. External features
2. Appendages

UNIT III

C. Mollusca

(i) General characters and Classification up to orders with examples.

(ii) Type Study: *Pila globosa* (Apple snail)

a. External features, pallium organ of pallial complex.

b. Digestive system

c. Respiratory system

d. Circulatory system

e. Excretory system

f. Nervous system

g. Sense Organs

h. Reproductive system.

i. Torsion & detorsion

UNIT IV

D. Echinodermata

(i) General characters and Classification upto orders with examples

(ii) Type study: *Asterias* (Star fish)

a. External Morphology.

b. Water vascular system.

c. Digestive system, Circulatory system, Skeletal system and Reproductive system.

d. Development and larval forms.

SEMESTER-II

Paper II (2ZOOTH2)

(GENETICS, EVOLUTION & ANIMAL DISTRIBUTION)

UNIT I

A. Genetics

i. DNA andRNA structure

ii. Evidence that nucleic acids are the genetic material :

a. Transformation in *Pneumococcus*

b. Hershey-Chase experiment

c. RNA as genetic material in small viruses

iii. Semi conservative mode of DNA replication : Meselson & Stahl's experiment.

iv. Genetic code

v. Transcription, post transcriptional changes in mRNA and translation.

vi. Molecular basis of mutation : Transition, Transversion & Frame shift mutation.

UNIT II

vii. Sex determination in *Drosophila* andMan.

viii. Sex chromatin bodies, dosage compensation and Lyon's hypothesis.

ix. Sex chromosomal abnormalities : Turner, Klinefelter's syndrome and Down Syndrome.

x. Blood groups : A, B, AB and O & Genetics of A, B, AB & O blood groups.

UNIT III

B. Evolution:

i. Mutation
ii. Variation
iii. Isolation & Speciation
iv. Modern synthetic theory of evolution

UNIT IV

C. Animal Distribution

i. Biogeographical distribution of animals
ii. Wallace line, Weber line, Galapagos Island, Continental drift
iii. Importance of animal fossils, their nature and age.
iv. Factors influencing large scale and animal distribution, dispersal and barriers.

Practical (Based on theory syllabus)

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SEMESTER- III

Paper-I (3ZOOTH1)

(HEMICHORDATA, PROTOCHORDATES & SPECIAL TOPICS)

UNIT I

A. **Hemichordata :**

(i) General characters & classification of Hemichordata upto orders :

(ii) **Type study:** *Balanoglossus*

a. Morphology

b. Circulatory

c. Digestive

d. Tornaria larva

e. Affinities

UNIT II

B. **Protochordates :**

(i) General characters & classification of Protochordata upto orders :

(ii) Type study: *Herdmania*

a. Morphology

b. Circulatory system

c. Digestive system

d. Reproductive organs

e. Tadpole larva

f. Retrogressive metamorphosis

UNIT III

(iii) **Type Study :** *Amphioxus* (*Branchiostoma*)

a. Morphology

b. Circulatory system

c. Digestive system

d. Primitive, degenerate and specialized characters

UNIT IV

C. Special Topics :

i. Biting mechanism in poisonous snakes.

ii. Flight adaptations in birds.

iii. *Sphenodon* as living fossil

Paper-II (3ZOOTH2)

(Classification of Vertebrates & Comparative Anatomy)

Unit-I

A. Classification of Vertebrates:

General characters and classification of Agnatha and Gnathostomata up to orders with examples

B. Comparative anatomy :

Comparative morphology and anatomy of *Scoliodon*, *Rana tigrina*, *Varanus*, *Columba* and *Lepus*, with references to the following systems :

(i) Integumentary system

a. Structure & functions of skin

b. Comparative study of Integument

1. Structure & development of placoid scale
2. Structure, classification and development of feathers.
3. Structure & development of hair.

Unit-II

(ii) Respiratory system

(iii) Circulatory system

a. Comparative circulatory

b. Comparative aortic arches

c. Comparative venous system

Unit-III

(iv) Digestive system

a. Structure of the alimentary canal

b. Glands

(v) Urinogenital system

a. Origin of gonads

b. Development of Pro-, meso- & metanephros.

Unit-IV

(vi) Nervous system

a. Definition & Classification

b. Development of Central Nervous System

c. Development, Structure & Comparison of Spinal Cord of Fish

d. Frog, Reptile, Bird and Mammal

e. Differentiation of Brain

f. Comparative study of Brain of *Scoliodon*, *Rana*, Varanus, *Columba* & *Lepus*

(vii) Skeletal system :

a. Development of skull *and* vertebral column,

b. Jaw suspension

SEMESTER-IV

Paper I (4ZOOTH1)

(ETHOLOGY, ECOLOGY & BIOCHEMISTRY)

Unit-I

A. Ethology

(i) Introduction and concept of Animal behavior.

(ii) Different methods and techniques of studying animal behaviour.

(a) Innate Behaviour :

1. Kinesis
2. Taxes
3. Reflexes

4. Instincts
5. Motivation

(b) Learned Behaviour:

1. Habituation
2. Imprinting
3. Trial and Error Learning
4. Latent Learning
5. Conditional Behaviour
6. Insight Learning
7. Reasoning

Unit-II

(c) Other types of Behaviour :

1. Social behaviour in Insects.
2. Parental care (e.g. Amphibia)
3. Migration : Birds and Fish (with special reference to life cycle of *Anguilla*)

Unit-III

B. Ecology

(i) Factors of ecology: Water and temperature

(ii) Ecosystem and components: Fresh water Ecosystem

(iii) Trophic levels : Food Chain, Food Web

(iv) Energy flow concepts and Pyramids

(v) Population dynamics

(vi) Bio-geo-chemical cycle : Nitrogen Cycle

(vii) Ecological Niche

Unit-IV

C. Biochemistry:

(i) Characteristics, classification, structure, nature and biological significance of Proteins, Carbohydrates and Lipids.

(ii) Classification, importance and sources of Vitamins.

a. Characteristics, classification, structure, nature of Enzymes and Co-enzymes.

b. Metabolism :

1. Glycolysis,
2. Kreb's cycle
3. Oxidative Phosphorylation
4. Gluconeogenesis
5. Cori's cycle
6. Urea cycle

Paper-II (4ZOOTH2)

PHYSIOLOGY

Unit-I

Physiology (Human) :

(i) Respiration:

a. Structure of lungs and air passage

b. Mechanism of breathing

c. Transport of oxygen and carbon dioxide in the body.

(ii) Circulatory system

a. Outline study of internal structure.

b. Heart beat and E.C G.

c. Blood clotting.

(iii) Digestion:

a. Digestion of food in mouth, stomach and small intestine.

b. Absorption and assimilation of digested nutrients in the body.

(iv) Excretion:

a. Structure of Kidney
b. Structure and functions of Uriniferous tubules
c. Mechanism of urine formation (Counter current theory).

Unit-III

(v) Nervous System :

a. Structure of different types of Neurons.
b. Conduction of nerve impulse across the axon and synapse
c. Reflex action.

(vi) Musculature:

a. Study of different types of muscles and their functions.
b. Mechanism of muscle contraction and sliding filament theory of muscle contraction

Unit-IV

(vii) Reproductive System :

a. Sexual reproduction in man

b. Reproductive organs

c. Menstrual cycle

d. Sex Hormones

e. Fertilization

f. Pregnancy

g. Parturition

h. Lactation

(viii) Endocrine System

a. Different kinds of endocrine glands and their secretions *and* function

b. Histology of Pituitary, Thyroid, Parathyroid and Sex glands.

c. Mechanism of Hormone action.

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SEMESTER-V

Paper-I (5ZOOTH1)

(ECONOMIC ZOOLOGY & MEDICAL ZOOLOGY)

UNIT-I

B. Economic Zoology

(i) General introduction of Economic Entomology

(ii) Biological control

(iii) Study of important pests of crop & their control.

a. Some important pests of cotton—study of life cycle, damage and control of *Pectinophora gosypeilla*

b. Some important pests of paddy—study of life cycle, damage & control of paddy stem borer.

c. Some important pests of vegetables - study of life cycle, damage and control of *Helicoverpa armigera.*

d. Some important pests of sugarcane—study of life cycle, damage and control of sugarcane stem borer

e. Study of life cycle, damage and control of five stored grain pests.

1. *Sitophilus oryzae.*
2. *Trogoderma granarium*
3. *Rhizopertha dominica*
4. *Pachimerus chinensis*
5. *Sitotroga cerealella*

UNIT II

(iv)Sericulture

(v) Apiculture

(vi) Lac culture

(vii) Pisciculture

a. Diseases of fresh water fishes and their control,

b. Basic knowledge of different types of fisheries.

c. Spawning & factors influencing spawning.

d. Economic value of fishes. fish as food and its by products.

UNIT III

C. Medical Zoology

(i) Protozoan parasites of man causing diseases:pathogenesis, diagnosis, prophylaxis end therapy (*Leishmania &Trypanosoma*).

(ii) Morphology, Life cycle, Pathogenesis, Prophylaxis and therapy of the following

a. Trematode parasites of man : *Fasciolopsis buski*

b. Cestode parasites of man: *Diphyllobothrium latum*

c. Nematode parasites of man: *Dracunculus medinensis*

(iii) Parasitic adaptations in Helminthes

UNIT IV

(iv) Arthropods of medical importance : General account and their classification, Species effects caused by Arthropods-dermatosis, myiasis, allergy. annoyance, blood loss.

(v) Arthropods as vectors

a. Diseases transmitted by Arthropods

1. Mechanical transmission
2. Biological transmission

b. Certain diseases transmitted by arthropods and their pathogenesis, Diagnosis, Treatment and control

1. Malaria
2. Yellow fever
3. Dengue
4. Plague

Paper II(5ZOOTH2)
(TAXONOMY, INSTRUMENTATION & BIOINFORMATICS)

UNIT I

A. Taxonomy

(i) Introduction to systematics, taxonomy and its significance in Zoology.

(ii) Biological species concept.

(iii) Study of different taxonomic characters

(iv) Different objectives of classification.

(v) Different theories of classification.

(vi) Principle of Hierarchic ranking,

(vii) Nomenclature - Use & application of code of Zoological Nomenclature.

UNIT II

B. Instrumentation

(i) pH meter
(ii) Electrophoresis
(iii) Chromatography

UNIT III

(iv) Photocolorimeter
(v) PCR
(vi) Autoradiography

UNIT IV

C.Bioinformatics

(i) Introduction to Bioinformatics

(ii) Scope of Bioinformatics

Paper III(5ZOOTH3)

(IMMUNOLOGY & MOLECULAR BIOLOGY)

Unit 1

A. Immunology

(i) Brief history

(ii) Principles

(iii) Immunity

(iv) Types of immunity.

(v) Components of immune system

(vi) Humoral & cell *mediated* immune response

Unit-II

(vii) Antigens and antibodies

(viii) Types of immunoglobulins

(ix) Physical and chemical properties of Immunoglobulin

(x) Major Histocompatibility Complex (MHC)

(xi) Transplantation antigens

Unit-III

B. Molecular Biology

(i) Eukaryotic genome organization

a. Unique and repetitive DNA sequences

b. Renaturation kinetics

(ii) Recombination in bacteria

a. Transformation

b. Transduction

c. Conjugation

Unit-IV

(iii)Transposon in prokaryotes: IS elements

(iv)Transposon in eukaryotes

a. Copia like element

b. Ty element

c. IAP

d. FB

e. TE

f. Ac/Ds

g. Spm/dspm elements

h. Retroposons

Practical based on theory syllabus

Semester-VI

Paper I (6ZOOTH1)

(Microbiology & Biotechnology)

Unit-I

A. Microbiology

(i) Introduction and scope of Microbiology.

(ii)Classification of bacteria and viruses

(iii)Morphology of bacteria and viruses

(iv)Nutrition, cultivation, growth and sterilization of microorganisms.

(v)Beneficial and harmful microorganisms in human's life.

(vi)Gene regulation in Prokaryote

Unit-III

B. Biotechnology

(i) Scope, importance and application of Biotechnology,

(ii)Tools of Genetic Engineering :

a. Enzymes with examples: Exonucleases, restriction endonucleases, ligase.

b. Cloning vectors : Plasmids, bacteriophages, insertion and expression vectors.

c. Introduction to stem cell technology and therapy.

Unit-IV

(iii) Technique of Genetic Engineering :

a. In-vitro synthesis of recombinant DNA
b. Gene cloning techniques.
c. Microinjection of DNA into fertilized eggs.

(iv) Nucleotide sequencing : Maxam - Gilbert and Sanger's techniques.

(v) Southern blot technique, c-DNA probes, Biosensors, Biochips.

(vi) Somatic call Hybridization :

a.Heterokaryons

b. Synkaryon

c. Cell Hybrids

d. Somatic cell genetics with reference to retinoblastoma

e. Gene expression in Somatic cell hybridization

Paper-II(6ZOOTH2)

(DEVELOPMENTAL BIOLOGY & BIOSTATISTICS)

Unit-I

A.Development Biology

(i) Definition, scope of developmental biology

(ii) Sexual reproduction :

a. Gametogenesis (spermatogenesis & oogenesis)

b. Maturation of gametes

c. Vitellogenesis

d. Parthenogenesis

Unit-II

(iii)Fertilization:

a.Mechanism

b. Significance

(iv) Cleavage.

a. Planes of cleavage

b. Patterns of cleavage

c. Rate of cleavage

d. Effect of yolk on cleavage

(v) Fate maps

(vi)Development upto gastrulation

a. Frog

b. Chick

(vii)Metamorphosis in Insects & Amphibians

a. Types of Metamorphosis

b. Significance of Metamorphosis

c. Hormonal Regulation of Metamorphosis

(viii)Regeneration ofAmphibian limb

Unit-III

B. Biostatistics

(i) Introduction — Role of Biostatistics inBiology

(ii) Measurement of Central Tendencies Methods of data collection and its treatment, definitions and calculation of:

a. Arithmetic Mean

b. Median

c. Mode

d. Range

e. Variance

f. Standard deviation

Unit-IV

(iii) Graphic representation

a. Bar Chart

b.Frequency histogram

c. Frequency polygon

d. Pie chart

Paper-III(6ZOOTH3)

(Environmental Biology & Toxicology)

Unit-I

A. Environmental Biology

(i) Environmental pollution : Different types of pollution sources, effects and control

a. Air

b. Water-source and nonsources point pollution

c. Soil

Unit-II

(ii) Environmental degradation and its socio-economic impact

a. Harmful effects of deforestation, desertification and overgrazing.

(iii) Wild life management in India & Its importance

Unit-III

B. Toxicology

(i) Concept and scope of Toxicology

(ii) Types of Toxicants

Unit-IV

(iii) Xenobiotics :

a. Translocation

b. Absorption and

c. Biotransformation

(iv) Teratogenesis

Practical based on Theory Syllabus