Revised Syllabus of Zoology 2017 Onwards

CSJM UNIVERSITY KANPUR
Syllabus of Zoology
(B.Sc. I, II, & III year)

Following Major title of papers of B.Sc. I, II, and III were finalized with their contents:
Theory Paper’s duration is of Three hours (except MCQ paper where duration is two hours only) and duration of practical assessment is Four hours.

### B.Sc. I

<table>
<thead>
<tr>
<th>Papers</th>
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<tbody>
<tr>
<td>Paper I</td>
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<td>50</td>
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<tr>
<td>Paper II</td>
<td>Higher Non Chordata (Annelida- Echinoderma)</td>
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<td>Paper III</td>
<td>Cell Biology and Genetics</td>
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<td>Paper III</td>
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<tr>
<td>Paper I</td>
<td>Applied and Economic Zoology</td>
<td>75</td>
</tr>
<tr>
<td>Paper II</td>
<td>Biotechnology, Immunology, Biological Tools &amp; Techniques and Biostatistics</td>
<td>75</td>
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<tr>
<td>Paper III</td>
<td>Ecology, Microbiology, Animal Behavior, Pollution and Toxicology</td>
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</tr>
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CSJM UNIVERSITY KANPUR
Syllabus of Zoology
(B.Sc. I, II, & III year)
B.Sc. - First Year
Practical

1- Dissection (Major) 12 Marks
2- Dissection (Minor) 05 Marks
3- One Temporary Mount 03 Marks
4- One Permanent Mount 05 Marks
5- Cytology & Genetics Preparation/Prepared slides 05 Marks
5- Identify and Comment upon spots (1-10) 10 Marks
6- Viva-Voce 05 Marks
7- Practical class record 05 Marks

Total 50 Marks

CSJM UNIVERSITY KANPUR
Syllabus of Zoology
(B.Sc. I, II, & III year)
B.Sc. - Second Year
Practical

1. Dissection(Major) 10 Marks
2. Permanent Mount 05 Marks
3. Comment upon Physiology Apparatus 05 Marks
4. (i) Suitable preparation of Hemin crystals from the blood 05 Marks
   (ii). Detect the Sugar /albumin / acetone from urine sample
5. Stained Preparation of 05 Marks
   (i) Striped or Unstriped muscles
   (ii) Cartilage (hand cut Section)
   (iii) Blood film/Aereolar tissue
6. Identify and Comment upon spots (1-10) 10 Marks
7. Viva-Voce test 05 Marks
8. Practical class record 05 Marks

Total 50 Marks
CSJM UNIVERSITY KANPUR
Syllabus of Zoology
(B.Sc. I, II, & III year)

B.Sc. - Third Year

Practical
1- Identification & Comment upon Sports 1-10 (Pests, Economically important animals) 15 Marks
2- Life cycles of Silk worm, Honey bee & Lac insects. 05 Marks
3- Experiments on Biotechnology/Immunology/Biostatistics/ Ecological Experiments. 10 Marks
4- Preparation of permanent mount (pertinent with Syllabus of practical) 10 Marks
5- Exercises on Microbiology/Tools. 05 Marks
6- Experiments on Pollution/Toxicology. 05 Marks
7- Experiments on Animal behavior 05 Marks
8- Viva-voce test 10 Marks
9- Project & Field Collection 10 Marks

Total 75 Marks
There will be three written theory papers and a practical examination. The marks in the practical shall be converted into grade with a grade index number and that number will serve as conversion index for converting grades in to marks as an average award out of marks of practical of one examination. Question No. 1 under section A in each class will be compulsory & comprehensively based on units I to IV and of short Answer type. There will be two more sections B and C. B shall comprise of four questions (2 to 5) from first half units and C will of four questions (6 to 10) from second half of the syllabus of concerned paper. Examinee shall attempt two questions from section B and two from section C. Each question of section B and C shall carry equal marks.

B.Sc. Part I

Paper I- Lower Non Chordata (Protozoa to Helminths)

The habits, morphology, physiology, reproduction, development, and classification up to Orders with suitable examples of the following Phyla with detailed study of the types given in each.

Unit-I
Protozoa - Euglena, Monocystis and Paramecium, Trypanosoma,

Unit-II
Porifera – Sycon, Canal System, Skeleton in Sponges

Unit-III
Coelenterata - Obelia and Aurelia, Coral and Coral reefs
Ctenophora - Salient features

Unit-IV
Platyhelminthes - Fasciola (liver fluke) and Taenia (tape worm)
Nematehelminthes - Ancylostoma (hook worm), Ascaris

Paper II- Higher Non Chordata (Annelida to Echinodermata)

The habits, morphology, physiology, reproduction, development, and classification up to Orders with suitable examples of the following Phyla with detailed study of the types given in each.

Unit-I
Annelida –Nereis, Hirudinaria

Unit-II
Arthropoda - Palaemon (prawn)

Unit-III
Mollusca -Pila (apple-snail), Unio

Unit-IV
Echinodermata -Pentaceros (excluding development)
Paper III- Cell Biology & Genetics

Unit-I

Unit-II
Cell Biology II: Structure and function of cell organelles with special emphasis on mitochondria, golgi bodies, nucleus, ribosome and endoplasmic reticulum, Lysosomes. Transcription and Translation.

Unit-III

Unit-IV
Genetics II: Sex determination, sex differentiation, Prenatal detection of genetic diseases (amniocentesis), Sex-linked characters, Criss-cross inheritance with examples, Linkage and crossing over, chromosomal aberrations, Eugenics. Euthenics, Genetic diseases and abnormalities

B.Sc. Part I
ZOOLOGY PRACTICAL SYLLABUS

PROTOZOA
(a) Amoeba: Examination of culture. Prepared Slide of Amoeba proteus and A. verrucosa.
(b) Euglena: Culture examination for Euglena. Prepared slides.
(c) Monocystis: Examination of contents of seminal vesicles of Pheretima or Eutyphoeus for different life-history stages and permanent preparation. Prepared slides.
(d) Plasmodium: Preparation of blood film (Leishmen’s stain). Prepared slides showing the parasites.
(e) Paramecium: Culture examination.
(f) Demonstration of ciliary movements in Paramecium. Addition to mucilage to restrain active movement. Treatment with Methyl green for staining. Feeding experiment with Congo Red and Yeast. Trichocysts (discharged). Prepared slides for structure, binary division and conjugation.
(g) Examination of pond water for different kinds of protozoa with special reference to Arcella and Vorticella.
(h) Study of prepared slides:
   Polystomella, Gregarina, Trypanosoma and Noctiluca.
(i) Examination of rectal protozoans Opalina, Balantidium and Nyctotherus.

PORIFERA
(a) Sycon: General characters
   Spicules glycine preparation or permanent mount. Prepared slides of transverse and longitudinal sections
(b) Gemmule of Spongilla permanent preparation.
(c) Different kinds of sponge spicules and sponging fibres of Euspongia-prepared slides.
(d) Euplectella (Venus’s flower-basket) Spongilla (fresh-water sponge), Euspongia (bath
sponge).

**COELENTERATA**
(a) **Hydra**
   Live specimens.
   Prepared slides of entire specimens.
   Longitudinal and transverse sections-prepared slides.
(b) **Obelia**
   Clony-prepared slide.
   Medusa-prepared slide.
(c) **Aurelia**
   General morphology.
   Tentaculocyst-prepared slide.
   Prepared slides and models of life-history stages.
(d) **Physalia** (Portuguese man of war), Corallium (red coral),
   Fungia (Mushroom coral), Madrepora (staghorn coral),
   Pennatula (sea pen), Sagartia of Metridium (sea anaemone)

**PLATHYHELMINTHES**
(a) **Fasciola**
   Specimens in situ and prepared slides. Transverse sections and prepared slides. Larval forms-prepared slides.
(b) **Taenia**
   Prepared slides of scolex, mature and gravid proglottids and transverse section of mature proglottid.
(c) Planaria, Polystomum, Paramphistomum, Schistosma, Echinococcus and Dipylidium
   Cysticerus (Bladder worm) and Cysticercoid.
(d) Examination of type worms of pigeon of fowl in situ
(e) Permanent preparation of mature and gravid proglottids of Cotugnia and Raellietina.

**NEMATHELMINTHES**
(a) **Ascaris**
(b) Ascaris lumbricoides (from man) specimens Enterobius vermicularisi (from man). Ancylostoma duodenale (from man) prepared slides.

**ANNELIDA**
(a) **Nereis**
(b) **Pheretima**
(c) Heteronereis, Arenicola, Aphrodite, Eutypoeus, Dero, Branchellion, Haemadipsa, Bonellia (female).

**ARTHROPODA**
(a) **Palaemon**
External characters; Examination of appendages. Dissections.
Glycerin or preparation stained preparation of hastate plate and statocysts.

(b) **Periplaneta**

(c) **Anopheles and Culex**
Glycerin or preparation stained preparation of mouth parts of male and female. Wings-prepared slides. Life history-prepared slides. Difference between Anopheles and Culex

(d) **Musca**
External characters. Glycerin or preparation stained preparation of proboscis

(e) Daphnia, Cyclops, Balanus, Eupagurus (hermit crab), Scylla (crab), Sacculina (on crab).
Larval forms Nauplius, Zoaea, Lepisma (Silver fish), Schistocerca (locust), Odontotermes (white ant), Cimex (bed bug), Pediculus (louse), Papilio (butterfly), Bombyx (Silk moth), Apis (honey-bee), Polistes (wasp), Camponotus (Black ant), Xenopsylla (rat flea), or Ctenocephalus (dog flea), Thyroglutus (millipede), Scolopendra (centipede). Lycosa (wolf-spider), Lxodes (tick), Limulus (King carb).

**MOLLUSCA**
(a) **Lamellidens**
External characters, Dissection of gill lamella and its permanent preparation. Transverse section through middle region of body and Glochidium (larva) - prepared slides.

(b) **Pila**
External characters. Dissection of nervous system. Permanent preparations of gill ctenidium and osphradium.

(c) Chiton, Teredo, Turbinellai (Shankh), Laevicaulis (slug), Doris, Aplysia, Dentalium. Nautilus, Sepia and Margaritifera (Pearl Oyster).

**ECHINODERMATA**
(a) **Pentaceros**: External characters. Dissected specimens. Pedicellaria and Transverse section of arm-prepared slide.

(b) **Echinus** (Sea urchin), Ophiothrix (brittle star), Holothuria (sea cucumber) and Antedon (feather star).

**CYTOLOGY**
(a) Cell-Structure – Prepared slides
(b) Cell Division – Prepared slides
(c) Preparation of giant chromosomes
(d) Preparation of onion root tip for the stages of mitosis
B.Sc. Part II (THEORY) Zoology
There will be three written papers and one practical examination. The following courses are prescribed.

**Paper I: Chordata**

**Unit- I**

**Hemichordata:** Classification up to orders; detailed study (habit, morphology, anatomy, physiology and development) of Balanoglossus

**Cephalochordata:** Classification and detailed study (habit, morphology, anatomy and physiology) of Branchiostoma (Amphioxus). Its importance in chordate evolution.

**Unit -II**

**Urochordata:** Classification up to orders; detailed study (habit, morphology, anatomy, physiology and postembryonic development i.e retrogressive metamorphosis) of Herdmania

**Unit-III**

Classification of different classes of vertebrates (*Pisces, Amphibia, Reptilia*) up to order with characters and examples. Poisonous and non poisonous snakes and biting mechanism. Neoteny. habit, morphology, anatomy and physiology of Scoliodon and Uromastix

**Unit-IV**

Classification of different classes of vertebrates (*Aves and Mammalian*) up to order with characters and examples. Flight adaptation in Birds, perching mechanism of Birds, Origin and evolution of Birds, Dentition in mammals, general organization of Primates

**Paper II: Animal distribution, Evolution and Developmental Biology**

**Unit-I**

**Animal distribution:** Geological and Zoogeographical distribution in different region with their characteristic fauna; Different types of fossils.

**Unit-II**

**Origin of Life, Theories of origin of life-Oparin model;concept of species (classical & modern concept)**

**Evolution:** Evidences (Anatomical paleontological physiological and serological); Theories of evolution (including Neo-Lamarckism, Darwin-Wallace theory of natural selection, Neo-Darwinism, Modernsynthetic theory). Evolution of Man. Mutation

**Unit-III**

**Developmental Biology I:** Aims and scope of Developmental Biology. Gametogenesis, Fertilization, Egg: structure and types. Types & patterns of cleavage

**Unit-IV**

**Developmental Biology II:** Process of Blastulation & Gastrulation. Fate Map. Development of Chick up to formation of Primitive streak and mammal (in out line) Extra embryonic membranes of chick. Placentation and types of Placenta.

**Paper III: Physiology and Biochemistry**

General physiology (in outline) with special reference to mammals
Unit-I
Physiology of digestion; Different enzymes and their functions from saliva to intestines and breakdown of complex food components, including function of exocrine pancreas and bile. Respiration; Physiology of exchange of gases, respiratory pigment transport of oxygen and CO₂ (Bohr’s effect, Chloride shift) RQ.
Blood and circulation; Composition of blood. Blood coagulation. Physiology of heart beat, general portal system in vertebrates.

Unit-II
Muscles; Structural and Mechanical basis of muscle contraction.

Unit-III
Physiology of endocrine system, Structure and Histology of various endocrine glands; their hormones target organs and functions. Thermoregulation in homotherms; in heterotherms – Aestivation and hibernation.

Unit-IV
Classification General chemistry and metabolism of carbohydrates, lipids and proteins; Enzymes-nomenclature classification coenzyme and isoenzyme.

B.Sc. Part II
ZOOTOLOGY PRACTICAL SYLLABUS

Urochordata
(a) Herdmania
(i) External characters
(ii) Dissection
(iii) (a) Permanent preparation of branchial wall
(b) Section of test and glycerine preparation of spicules.
Glycerine and permanent preparation on neural gland complex (neural gland, nerve ganglion and dorsal tubercle).
(iv) Larva and metamorphosis- prepared slides.
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(b) (i) Thaliacea : Pyrosoma, Doliolum
(ii) Larvacea : Oikopleura.

Cephalochordata
Branchistoma (Amphioxus)
(i) General features
(ii) (a) Permanent preparation of the pharyngeal wall
(b) Oral hood and velum- prepared slides
(c) Transverse section through the body – prepared slides.
(d) Models illustrating development

Cyclostomata
Petromyzon (Lamprey) - External characters
Chondrichthyes
(a) Fish
(i) External characters
(ii) Exo-skeleton Glycerine and permanent preparation of placoid scales
(iii) Myotomes
(iv) Endoskeleton
(1) Axial skeleton
(a) skull
(b) Visceral Skeleton
(c) Vertebral column
(2) Appendicular skeleton
(a) Pectoral girdle and fins
(b) Pelvic girdle, fins and claspers
(c) Median fins
(v) Dissection
(a) Digestive system
Examination of the folds of stomach and “scroll valve”
(b) Vascular system
Heart, ventral aorta, dorsal aorta, arterial arches (afferent and efferent)
(c) Gills
(d) Urinogenital system
(e) Nervous system: Cranial nerves
(f) Internal ear
(g) Eye muscles
(h) Permanent preparation of ampullae of Lorenzini
(i) Section through various regions of the body of adult and embryo
(j) Embryo with yolk-sac placenta
(b) Pritis (Saw fish), Astrape (Indian electric ray), Chimaera (rabbit fish) Slide showing development of placoid scales.

Osteichthyles
(a) Labeo rohita (rohu) - General morphology and dissected specimen.
(b) Acipenser (sturgeon), Lepidosteous (gar-pike), Hippocampus (sea hourse) Antennarius (Indian angler), Angulla (eel), Pleuronectes (sole), Exocoetus (flying fish), Clarius (cat fish), Anabas (climbing perch) and Neoceratodus (lungfish).
(c) Different kinds of scales- prepared slides

Amphibia
(a) Rana tigrina (The Indian bull-frog)
Development of frog from models
(b) Urodela:
Necturus, Ambystoma and Axolotal larva
(c) Anura:
Bufo, Rhacophorus (tree frog), Alytes (midwife toad).
(d) Gymnophiona: Ichthyopnis

Reptillia
(a) Varanus
(i) External characters
(ii) Skeleton
(1) Axial Skeleton
(a) Skull
(b) Vertebral column

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(c) Ribs and sternum

2) **Appendicular Skeleton**
(a) Pectoral girdle and fore-limb.
(b) Pelvic girdle and hind-limb.

(b) **Lacertilla**
Varanus (Indian monitor), Holoderma (poisonous lizard)
Hemidactylus (wall lizard), Chamaeleon (garden lizard)
Draco (flying lizard).

(e) **Ophidia**
Difference between poisonous and non-poisonous snakes, Naja (cobara),
Vipera (viper), Typhlops (burrowing snake) and Python. Biting mechanism
of a poisonous snake (model).

(d) **Chelonia** : Derman armature

(e) **Crocodilia** : Difference between Alligator, Crocodile and Gavialis.

(f) Extinct reptiles. Models (five)
**Dimetrodon, Diplodocus, Pteranodon, Tyrannosaurus and Ichthyosaurus**

Aves

(A) **Columbia livia intermedia** (pigeon)
(i) External Characters. Structure of Feather. Varieties of feathers. Developments of
feather-prepared slide.
(ii) Skeleton of fowl Axial skeleton:
(a) Skull
(b) Vertebral column
(c) Ribs and sternum
(2) Appendicular skeleton.
(a) Pectoral girdle and fore-limb
(b) Pelvic girdle and hind-limb.

(B) (i) Archaeornithes-Archaeopteryx (cast)
(ii) Neornithes:
(a) Palaeognathae: **Struthio** (ostrich);
(b) Neognathae: **Gallus** (fowl), **Anser** duck, **Corvus** (crow), **Psuttacuka**
(parrot) and **Pavo** (peacock).
Perching mechanism: Model
Skulls and Beaks of Birds.
Feet of birds: Models

(C) Embryonic membranes-whole mount of 72 hour’s chick embryo

Mammalia

(A) (i) Prototheria: Ornithorhynchus (Platypus)
(ii) Metatheria : Macropus (Kangaroo).
(iii) Eutheria :
(a) Edentata: Dasypus (Armadillo)
(b) Pholidota: Manis (Scaly ant-eater).
(c) Cetacea: Platanista (Ganges dolphin).
(d) Perissodactyla: Equus cabalus (horse), Equus vulgaris (ass), Equus zebra
(zebra), Rhinoceros unicornis (rhinoceros).
(e) Artictyla: Camelus dromedaries (A rabian camel), Giraffa camelopardalis
(giraffe) Box (ox), Ovis (sheep), Capra (goat), Cervus (deer), Sus (dog).
(f) Proboscidea: Elephas indicus (elephant).
(g) Carnivora: Felis domesticus (Cat), Panthera leo (lion), Acinonyx tigris
(Cheetah), Canis familiaris (dog), Ursus (bear) Hyaena (hyena), Phoca (seal)
(h) Rodentia: Mus (domestic rat), Hystrix (Porcupine)
(i) Lagomorpha: Lepus and Oryctolagus (hare and rabbit)
(j) Insectivora: Erinaceus (hedge-hog), Crocidura (chhachhundar)
(k) Chiroptera: Pteropus (Flying-fox).
(l) Primates: Macaca (rhesus monkey), Hylobates (gibbon), Simia (Orangutan),
Anthropo pithecus (chimpanzee), Gorilla, Homo sapiens (man).

**Histology**

(i) Tissues: Preparation of the following
(a) Epithelia:
(i) Squamous (ii) Ciliated and (iii) Stratified
(b) Muscular:
(i) Striped muscles (ii) Unstriped muscles.
(c) Connective
(i) Areolar tissue (ii) Tendon the leg muscles of frog (tease and examine in glycerine)
(ii) Adipose tissue from insect and frog (iv) cartilage (free hand sections of frogs
hyoid and suprascapula, train with haematoxyline and (v) Bone (Decalcified).
(d) Blood; Preparation of Vertebrate blood film, stain with Leishmann’s stain.
(e) Nervous: Neurons
(f) Histology of various organs-prepared slides.

**Physiology**

(i) Experiments to be performed by candidates: Test for amylase. Osmolarity of
blood, Hemin crystals and test for sugar and acetone in urine Determination of
haemoglobin % in blood sample (s).
(ii) Detection of amino acids in blood of an animal by paper chromatography.
General :
Candidates will be required, to show knowledge of the method of microscopic
techniques and to examine, describe or dissect the types prescribed. Candidates will
also be required to submit their notebooks containing a complete record of laboratory
work initiated and dated by the teacher for the determination of result of examination.
B. Sc. Part III (THEORY) Zoology

There will be three written papers and one practical examination. The following courses are prescribed.

**PAPER-I Applied and Economic Zoology**

**Unit-I**
Parasitology:
Structure, life cycle, pathogenicity, including diseases, causes, symptoms and control of the following parasites of domestic animals and humans: Entamoeba histolytica, Giardia and Wuchereria.

**Unit-II**
Vectors and pests: Life cycle and their control of following pests: Gundhi bug, Sugarcane leafhopper, Rodents, Termites and Mosquitoes and their control.

**Unit-III**
Animal breeding and culture: Aquaculture, Pisciculture, Poultry, Sericulture, Apiculture, Lac-culture.

**Unit-IV**
Wild Life of India: Endangered species. Important sanctuaries; national parks of India; Different projects launched for the preservation of animal species; in-situ and ex-situ conservation of wild life.

**PAPER-II Biotechnology, Immunology, Biological Tools and Techniques and Biostatistics**

**Unit-I**
Biotechnology: Genetic Engineering (concept and recombinant DNA technology) and its application in agriculture & medical areas and energy production. Biotechnology of food processing, pharmaceuticals (e.g. use of microbes in insulin production) and fermentation. Alcohol and beverages.

**Unit-II**
Immunology: Concepts of immunity, types of immunity, Antigen and Antibodies, vaccines of different diseases and immunological reactions.

**Unit-III**

**Unit-IV**
Biostatistics: Sampling, Measures of central tendency (mean, median and Mode) and dispersion (variance, standard deviation and standard error); Correlation and Regression.

**PAPER-III Ecology, Microbiology Animal Behavior and Pollution and Toxicology**

**Unit-I**

**Unit-II**
**Microbiology:** Morphology, physiology and infection (outline) of bacteria and viruses. Bacterial and viral diseases.

**Unit-III**

**Animal Behavior:** Introduction to Ethology and Psychobiology, Patterns of behavior (taxes, reflexes, instinct and motivation); biorhythms; learning and memory imprinting their role in, Migration of fishes Schooling and shoaling & birds.

**Unit-IV**

**Pollution and Toxicology:** Concept, sources, types (air, water, soil, noise & radiation), and control of environmental pollution. Exposure of toxicants (routes of exposure, and duration and frequency of exposure); dose - response relationship categories of toxic effects.

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**B.Sc. Part III**

**ZOOLOGY PRACTICAL SYLLABUS**

Permanent Preparation of: Euglena, Paramecium and rectal protozoans from frog. 
Stool examination for different intestinal parasites. 
Study of prepared slides / specimens of Entamoeba, Giardia, Leishmania, Trypanosoma, Plasmodium, Fasciola, Cotugnia, Taenia, Rallietina, Polystoma Paramphistomum, Schistosoma, Echinococcus, Dipyldium, Enterobius, Ascaris and Ancyllostoma; 
Permanent Preparation of Cimex (bed bug) / Pediculus (Louse), Haematopinus (cattle louse), fresh water annelids, arthropods; and soil arthropods. 
Larval stages of helminths and arthropods. 
Permanent mount of wings, mouth parts and developmental stages of mosquito and horse fly. 
Collection and identification of pests. 
Life history of silkworm, honeybee and lac insect. 
Different types of important edible fishes of India. 
Prepared slides of plant nematodes. 
Demonstration of counting of cells (blood and protozoan) by haemocytometer, haemoglobinometer, pH meter, Colorimeter 
Microbiological Techniques: Media Preparation and sterilization, inoculation and Monitoring. 
Study of an aquatic ecosystem, its biotic components and food chain. 
Preparation of chromosomes, Test for carbohydrate Photochemical demonstration of proteins and lipids, using hand sections using hand sections, endocrine glands (Neurosecretory cells) of cockroach. 
Demonstration of developmental stages of chick. 
Project Report / model chart making. 
**Dissections:** 
**Cockroach:** Central nervous system  
**Wallago:** Afferent and efferent branchial vessels, Cranial nerves, Weberian ossicles. 
Practical exercises based on Biostatistics, Microbiology, Immunology, Biotechnology, Animal Behavior, Pollution & Toxicology.