

B.Sc. Zoology Syllabus in Semester System (2019 onwards)

Semester	Type of Paper	Paper	Title
I	Subjective	1	Lower Non-Chordata (Protozoa to Helminths)
	Subjective	2	Higher Non-Chordata (Annelida to Echinodermata)
II	MCQ	3	Cell Biology & Genetics
	PRACTICAL		Practical
III	Subjective	4	Chordata
	PRACTICAL		Practical
IV	MCQ	5	Animal Physiology & Biochemistry
	MCQ	6	Evolutionary Biology & Developmental Biology
V	Subjective	7	Animal behaviour, Chronobiology, Endocrinology and Neurobiology
	Subjective	8	Economic Zoology
	PRACTICAL		Practical
VI	MCQ	9	Molecular Biology & Immunology
	MCQ	10	Bioinstrumentation, Biotechnology, Bioinformatics and Biostatistics
	MCQ	11	Environmental Biology, Wildlife & Toxicology

B.Sc. Zoology Semester Pattern Syllabi

SEMESTER-I

Paper 1- Lower Non Chordata-I (Protozoa to Helminths)

The habits, morphology, physiology, reproduction, development (in outline) and classification of the following groups of animals including a detailed study of the types given in each:

Unit-I

Protozoa: *Euglena, Plasmodium, Monocystis* and *Paramecium*.

Unit-II

Porifera: *Sycon*

Unit-III

Cnidaria: *Obelia* and *Aurelia*

Ctenophora: Salient features

Unit-IV

Platyhelminthes: *Fasciola* (Liver fluke) and *Taenia* (Tape worm)

Nemathelminthes: *Ascaris* and *Ancylostoma* (Hook worm).

Paper 2- Higher Non-Chordata (Annelida to Echinodermata)

Unit-I

Annelida: *Nereis* and *Hirudinaria* (Leech).

Unit-II

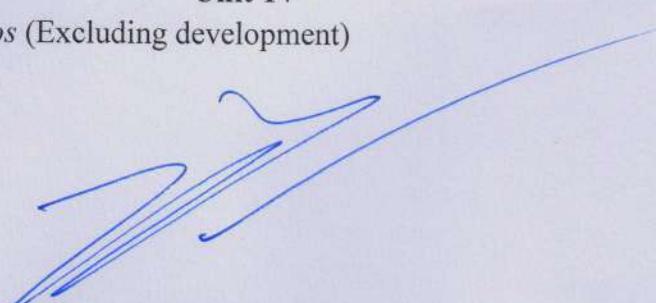
Arthropoda: *Palaemon* (prawn) and *Schistocerca* (Locust)

Unit-III

Mollusca: *Lamellidens* (fresh water mussel) and *Pila* (Apple snail)

Unit-IV

Echinodermata: *Pentaceros* (Excluding development)



Semester-II

Paper 1- Cell Biology & Genetics

Unit-I

Cell Biology I

Structure and function of cell, Ultra structure and function of cell membrane, Golgi body, ribosome, nucleus and endoplasmic reticulum.

Unit-II

Cell Biology II

Structure and function of mitochondria, lysosome and peroxisome. Cell Division: Mitosis and Meiosis.

Unit-III

Genetics I

Structure of chromosomes, Watson & Crick Model of DNA, Differences between DNA and RNA. Mendel's principles of heredity on chromosomal basis, Monohybrid cross, test cross, dihybrid cross, back cross incomplete dominance, Multiple Alleles, Blood group inheritance. Linkage and crossing over, interaction of genes.

Unit-IV

Genetics II

Sex determination, sex differentiation, Sex-linked characters, Sex influenced characters. Chromosomal aberrations (structural and numerical), Mutation, Genetic diseases and abnormalities, Eugenics.



Practical Syllabus Semester II

PROTOZOA

- (a) Examination of pond water for different kinds of protozoans
- (b) Study of prepared slides: *Amoeba*, *Euglena*, *Vorticella*, *Noctiluca*, *Monocystis*, *Arcella*, *Paramecium*, *Plasmodium*, *Opalina*, *Nyctotherus*, *Balantidium*, *Polystomella*, *Gregarina*, *Trypanosoma*.

PORIFERA

- (a) *Sycon*: Spicules glycerine preparation. Transverse and longitudinal sections-prepared slides.
- (b) Gemmule of *Spongilla* permanent preparation.
- (c) Different kinds of sponge spicules and spongin fibres of *Euspongia*-prepared slides.
- (d) *Euplectella* (Venus's flower-basket), *Spongilla* (fresh-water sponge), *Euspongia* (bath sponge).

CNIDAIRA

- (a) *Obelia*: Colony-prepared slide, Medusa-prepared slide.
- (b) *Aurelia*: General morphology, Tentaculocyst-prepared slide. Prepared slides and models of life-history stages.
- (c) *Physalia* (Portugese Man of war), *Corallium* (red coral), *Fungia* (Mushroom coral), *Madrepora* (staghorn coral), *Pennatula* (sea pen), *Metridium* (sea anemone)

PLATHYHELMINTHES

- (a) *Fasciola*: Prepared slides, Transverse sections, Larval forms-prepared slides.
- (b) *Taenia*: Mature and gravid proglottids
- (c) *Planaria*, *Polystomum*, *Paramphistomum*, *Schistosoma*, *Echinococcus* and *Dipylidium*, *Cysticercus* (Bladder worm), mature and gravid proglottids of *Cotugnia* and *Ralletina*.

NEMATHELMINTHES

- (a) *Ascaris*: External characters of male and female. Transverse section of male and female-prepared slides.
- (b) *Ascaris lumbricoides*, *Enterobius vermicularis*, *Ancylostoma duodenale* prepared slides.

ANNELIDA

- (a) *Nereis*: Parapodium-permanent preparation. Transverse sections-prepared slides.
- (b) *Pheretima*: Glycerine preparations of setae in situ and brain. Permanent preparations of Septal nephridia.
- (c) *Heteronereis*, *Arenicola*, *Aphrodite*, *Lumbricus*, *Dero*, *Branchellion*, *Haemadipsa*, *Bonellia* (female).

ARTHROPODA

- (a) *Palaemon*: Appendages, Dissection of Central Nervous System, Glycerine preparation of hastate plate. Glycerine preparations of statocysts.
- (b) *Anopheles* and *Culex*: Mouth parts of male and female.
- (c) *Musca*: Glycerine preparation of proboscis.
- (d) *Daphnia*, *Cyclops*, *Balanus*, *Eupagurus* (hermit crab) *Scylla* (crab), *Sacculina* (on crab). Larval forms (Nauplius, Zoa), *Lepisma* (Silver fish), *Schistocerca* (locust), *Odontotermes* (white ant), *Apis* (honey-bee), *Xenopsylla* (rat flea), *Thyroglobulus* (millipede), *Scolopendra* (centipede). *Lycosa* (wolf-spider), *Ixodes* (tick), *Limulus* (King crab).

MOLLUSCA

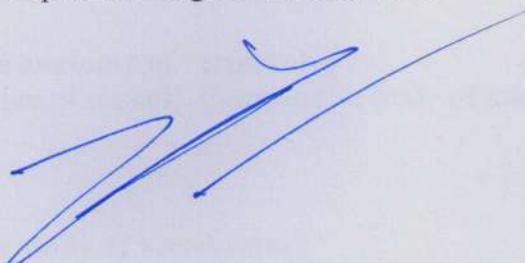
- (a) *Lamellidens*: Dissection, Permanent preparations of gill lamella. Transverse section through middle region of body-prepared slides. Glochidium (larva) prepared slides.
- (b) *Pila*: Dissection. Permanent preparations of gill lamella and osphradium.
- (c) *Chiton*, *Teredo*, *Turbinella* (Shankh), *Laevicaulis* (slug), *Doris*, *Aplysia*, *Dentalium*, *Nautilus*, *Sepia* and *Pinctada margaritifera* (Black lip pearl oyster)

ECHINODERMATA

- (a) *Pentaceros*: Pedicellaria-prepared slides. 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



Semester III

Paper 1- Chordata

Unit- I

Hemichordata: General characters of Hemichordata and affinities of *Balanoglossus*

Cephalochordata: Classification and detailed study (habit, morphology, anatomy and physiology) of *Branchiostoma (Amphioxus)*.

Urochordata: Classification and detailed study (habit, morphology, anatomy, physiology and post embryonic development) of *Herdmania*.

Pisces: Classification and detailed study (habit, morphology, anatomy and physiology) of *Scoliodon*.

Unit -II

Amphibia: General Characters, Classification up to order and examples.

Reptilia: General Characters, Classification up to order and examples.

Aves: General Characters, Classification up to order and examples. Flying adaptations.

Mammalia: General Characters, Classification up to order and examples.

Unit-III

Comparative anatomy of vertebrates

Histology (types of tissues). Comparative study of integument and skeleton.

Unit-IV

Comparative study of vertebrates

Digestive, respiratory, circulatory, nervous, receptor and urinogenital systems.



Semester III

Urochordata

- (a) *Herdmania*: Larva and metamorphosis- prepared slides.
- (b) Ascideacea: *Herdmania*
- (c) Thaliacea: *Pyrosoma, Doliolum*
- (d) Larvacea: *Oikopleura*.

Cephalochordata

- (a) *Branchistoma (=Amphioxus)*: Permanent preparation of the pharyngeal wall, Oral hood and velum- prepared slides, Transverse section through the body – prepared slides, Models illustrating development

Pisces

- (a) Cyclostomata: *Petromyzon* (Lamprey) and *Myxine* (Hagfish)
- (b) **Fish:** External characters, Glycerine and permanent preparation of scales, Dissection, Heart, ventral aorta, dorsal aorta, arterial arches (afferent and efferent), Cranial nerves, Internal ear, Ampullae of Lorenzini
- (c) Embryo with yolk-sac placenta
- (d) *Pristis* (Saw fish), *Astapse* (Indian electric ray), *Chimaera* (rabbit fish), *Acipenser* (sturgeon), *Lepidosteous* (gar-pike), *Hippocampus* (sea hourse) *Antennarius* (Indian angler), *Anguilla* (eel), *Pleuronectes* (sole), *Exocoetus* (flying fish), *Clarias* (cat fish), *Anabas* (climbing perch), *Neoceratodus*, *Protopterus* (lungfish), Different kinds of scales- prepared slides

Amphibia

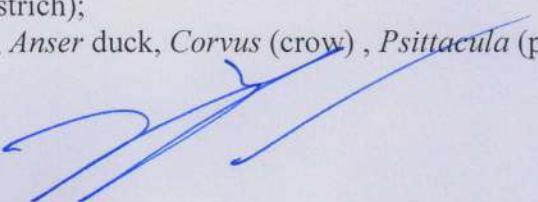
- (a) Urodela :*Necturus, Ambystoma* and Axolotl larva
- (b) Anura :*Bufo, Rhacophorus* (tree frog), *Alytes* (midwife toad).
- (c) Gymnophiona : *Ichthyophis*

Reptilia

- (a) *Varanus*: Axial and Appendicular Skeleton
- (b) Lacertilia: *Varanus* (Indian monitor), *Heloderma* (poisonous lizard), *Hemidactylus* (wall lizard), *Chamaeleon* (garden lizard), *Draco* (flying lizard).
- (c) Ophidia: *Naja* (cobra), *Bungarus* (common krait), *Vipera* (viper), *Typhlops* (burrowing snake) and *Python*.
- (d) Chelonia : Dermal armature
- (e) Crocodilia : *Alligator, Crocodilus* and *Gavialis*.
- (f) Extinct reptiles (Models) *Dimetrodon, Diplodocus, Pteranodon, Tyrannosaurus* and *Ichthyosaurus*

Aves

- (a) *Gallus*: Axial and Appendicular skeleton
- (b) Archaeornithes-*Archaeopteryx* (cast)
- (c) Palaeognathae: *Struthio* (ostrich);
- (d) Neognathae: *Gallus* (fowl), *Anser* duck, *Corvus* (crow) , *Psittacula* (parrot) and *Pavo* (peacock).



- (e) Types of feathers, beaks and feet of birds
- (f) Whole mount of 24, 36, 48 and 72 hour's chick embryo

Mammalia

- (a) Prototheria: *Ornithorhynchus* (Platypus)
- (b) Metatheria : *Macropus* (Kangaroo).
- (c) Eutheria :
 - i. Edentata: *Dasypus* (Armadillo)
 - ii. Pholidota: *Manis* (Scaly ant-eater).
 - iii. Cetacea: *Platanista* (Ganges dolphin).
 - iv. Perissodactyla: *Equus cabalus* (horse), *Equus vulgaris* (ass), *Equus zebra* (zebra), *Rhinoceros unicornis* (rhinoceros).
 - v. Artiodactyla: *Camelus dromedaries* (A rabian camel), *Giraffa camelopardalis* (giraffe) *Bos* (ox), *Ovis* (sheep), *Capra* (goat), *Cervus* (deer), *Sus* (dog).
 - vi. Proboscidea: *Elephas indicus* (elephant).
 - vii. Carnivora: *Felis domesticus* (Cat), *Panthera leo* (lion), *Acinonyx tigris* (Cheetah), *Canis familiaris* (dog), *Ursus* (bear) *Hyaena* (hyanea), *Phoca* (seal)
 - viii. Rodentia: *Mus* (domestic rat), *Hystrix* (Porcupine)
 - ix. Lagomorpha: *Lepus* and *Oryctolagus* (hare and rabbit)
 - x. Insectivora: *Erinaceus* (hedge-hog), *Crocidura* (chhachhundar)
 - xi. Chiroptera: *Pteropus* (Flying-fox).
 - xii. Primates: *Macaca* (rhesus monkey), *Hylobates* (gibbon), *Simia* (Orang-utan), *Anthropopithecus* (chimpanzee), *Gorilla*, *Homo sapiens* (man).

Histology

- (a) Tissues: Preparation of
 - i. Epithelial: Squamous (Oral), Ciliated, and Stratified
 - ii. Muscular: Striped and Unstriped muscles.
 - iii. Cartilage
 - iv. Blood
 - v. Neurons
 - vi. Histology of various organs-prepared slides.

Physiology

- (a) 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).
- (b) Detection of amino acids in blood of an animal by paper chromatography.



Semester-IV

Paper 1- Animal Physiology and Biochemistry

General physiology (in outline) with special reference to mammals.

Unit-I

Physiology of digestion, respiration, blood and its circulation (blood coagulation, transport of O₂ and CO₂).

Unit-II

Physiology of excretion and osmoregulation, nervous and muscular system and thermoregulation.

Unit-III

Classification of carbohydrates, lipids and proteins.

Classification of Enzymes: Michaelis-Menten kinetics.

Unit-IV

Cellular biochemistry: glycolysis, Krebs cycle, Electron Transport System, gluconeogenesis, glycogenolysis, glycogenesis.



Paper 2- Evolutionary Biology and Developmental Biology

Unit-I

Theories of Evolution

Origin of Life

Historical Review of Evolutionary concept: Lamarckism, Darwinism (Natural, Sexual and Artificial Selection)

Modern Synthetic theory of Evolution

Patterns of Evolution (Divergence, Convergence, Parallel and Coevolution)

Unit-II

Processes of Evolution

Microevolution and Macroevolution, Speciation, Population Genetics (Hardy Weinberg Law)
Genetic Death, Extinction, Bioinvasion

Unit-III

Developmental Biology I

Gametogenesis, Fertilization, Egg: structure and types. Types and patterns of cleavage. Stem Cell and its potency. Fate Map

Unit-IV

Developmental Biology II

Morula, Blastulation and Gastrulation. Development of Chick up to formation of Primitive streak and mammal (*in outline*)

Extra embryonic membranes of chick.

Placentation and types of Placenta.

