

Kumaun University, Nainital
ZOOLOGY DEPARTMENT
CURRICULA- SEMESTER SYSTEM
Three Years (Six semester) Programme w.e.f. 2016-17
Kumaun University, Nainital

Semester system course structure:

- *The course work shall be divided into six semesters with three papers in each semester.*
- *Each paper in a semester will be of 80 marks out of which 60 marks for theory and 20 marks are allotted for internal assessment (written test/assignment/both)*
- *Each theory paper shall consists of section (A): 20% of total marks (12 marks; one question of 12 parts; multiple choice, one word/one sentence answer, fill in the blanks, true- false; all parts will be compulsory), section (B): 40% of total marks (24 marks, one question of 06 parts; any 04 have to be attempted with short answer) and section (C): 40% of total marks; (24 marks, 04 questions, any two have to be attempted with long answer).*
- *Question paper shall cover the whole syllabus.*
- *Practical in each semester will be of total 60 marks, out of which 15 marks are assigned for internal assessment (attendance, practical records etc.).*
- *Practical examination will be evaluated by both external and internal examiner.*
- *The duration of theory and practical examination shall be 03 hrs and 03.5 hrs, respectively.*
- *Candidates may be permitted to use simple calculators in paper third (Bio-informatics and Bio-statistics) of 6th semester.*

B.Sc. - Zoology

I Semester:

Paper I	-	Lower Non-Chordata (60+20)
Paper II	-	Higher Non-Chordata (60+20)
Paper III	-	Cell- Biology (60+20)
Practical	-	Related to the Syllabus of first semester (45+15)

II Semester:

Paper I	-	Molecular Biology, Elementary Biotechnology and Biological Techniques (60+20)
Paper II	-	Taxonomy, Evolution and Elementary Palaeontology (60+20)
Paper III	-	Genetics (60+20)
Practical	-	Related to the Syllabus of second semester (45+15)

III Semester:

Paper I	-	Lower Chordata (60+20)
Paper II	-	Higher Chordata (60+20)
Paper III	-	Ecology and Environmental Biology (60+20)
Practical	-	Related to the Syllabus of third semester (45+15)

IV Semester:

Paper I	-	Developmental Biology (60+20)
---------	---	-------------------------------

Paper II	-	Applied Zoology (60+20)
Paper III	-	Elementary Entomology and Applied Ichthyology (60+20)
Practical	-	Related to the Syllabus of fourth semester (45+15)

V Semester:

Paper I	-	Microbiology (60+20)
Paper II	-	Animal Behaviour (60+20)
Paper III	-	Toxicology and Histology (60+20)
Practical	-	Related to the Syllabus of fifth semester (45+15)

VI Semester:

Paper I	-	Biological Chemistry and Basic Mammalian Endocrinology (60+20)
Paper II	-	Animal Physiology Endocrinology (60+20)
Paper III	-	Bioinformatics and Biostatistics Endocrinology (60+20)
Practical	-	Related to the Syllabus of sixth semester (45+15)

B.Sc. Zoology : Semester- I

Paper I: Lower Non-Chordata

MM 60

Salient features and outline classification (upto orders) of various Lower Non-chordate Phyla and related type study and topics as covered under respective Phyla.

Protozoa: *Paramecium* with particular reference to locomotion, nutrition, osmoregulation and reproduction. Taxonomy, morphology (including adaptations), life cycle, pathogenicity and control measures of *Trypanosoma*, *Leishmania*, *Giardia*, *Plasmodium*, *Entamoeba histolytica*.

Porifera: *Sycon* with reference to structure, reproduction and development. Canal system, and affinities of Porifera.

Coelenterata: *Aurelia* with reference to structure, reproduction and development. Polymorphism in Coelenterata. A brief account of Corals and Coral reefs.

Helminthes: Taxonomy, morphology (including adaptations), life cycle, pathogenicity and control measures of *Fasciola*, *Ancylostoma*, *Schistosoma*, *Ascaris*, *Filaria* (including periodicity).

Parasitic adaptations in Helminthes.

Paper II: Higher Non-Chordata

MM 60

Salient features and outline classification (upto orders) of various Higher Non-chordate Phyla and related type study and topics as covered under respective Phyla.

Annelida: *Nereis*- External features, excretory organs and reproduction. Metamerism in Annelida, its origin and significance. Trochophore larva and its significance. Parasitic adaptations in Hirudinaria.

Arthropoda: *Palaemon*- External features and reproduction. *Peripatus*- Its distribution and Zoological importance.

Mollusca: *Pila*- External features, Organs of Pallial complex. Reproduction. A brief account of torsion in Gastropoda.

Echinodermata: *Asterias*- External features. Water vascular system. Mode of feeding and reproduction.

Paper III: Cell Biology

MM 60

Prokaryotic and Eukaryotic cells; Ultrastructure of eukaryotic cell; Plasma membrane (Ultrastructure, chemical composition , models of plasma membrane; Specialisations of plasma membrane , functions of plasma membrane).

Structure and functions of following cell organelles: (a) Mitochondria (b) Ribosomes (c) Lysosomes (d) Centrioles (e) Golgi Complex (f) Endoplasmic reticulum. Structure and functions of Nucleus and nucleolus.

Cell division – (a) Cell cycle (b) Mitosis (Process of mitosis , mitotic poisons and significance of mitosis), (c) Meiosis (Process of meiosis, structure and functions of synaptonemal complex, significance of meiosis). An idea of cell transformation and cancer.

Eukaryotic chromosomes- Structure, chemical composition, classification and unigenic and multigenic concept of chromosome structure.

Structure and functions of polytene and lampbrush chromosomes. Dosage compensation in *Drosophila* and man; Barr body.

B.Sc. Zoology: Semester-I, Practical's

A complete record of laboratory work will be maintained by every student. The practical work will consist of the following:

1. Study of living animals: *Amoeba*, *paramecium*, *Euglena*, *Hydra*, and rectal ciliates
2. Study of Nervous-system/General anatomy with the help of charts/models and simulation of *Earthworm*, *Prawn*, *Pila*, *Unio*.
3. Permanent preparation of Obelia colony: Ovary, setae in situ, pharyngeal and septal nephridium of earthworm, parapodia of Nereis and Heteronereis, gill radula and osphradium of Pila, salivary glands, mouth parts and trachea of cockroach; gill lamina of Unio, statocyst and hastate plate of prawn.
4. Study of permanent slides/museum specimens/models belonging to following phyla
Protozoa: Amoeba, Paramecium, Euglena, Ceratium and Noctiluca.
Porifera: T.S. and L.S. of Sycon, Euplectella, Hyalonema and Spongilla.
Coelenterata: Medusa of Obelia, larval stages of Aurelia, Physalia, Porpita, Vellela, Tubipora, Millepora, Aurelia, Gorgonium, Pennatula, Alcyonium, Adamsia.
Annelida: T.S. of earthworm and Nereis through different body regions. Nereis, Heteronereis, Arenicola, Chaetopterus,
Arthropoda: Mouth parts of insects, Pupa and larva of mosquito Daphnia Cyclops and larval stages of Crustaceans. Crab, hermit crab, Lepas, Balanus, Astaxus, Squilla, millipede, mantis, cricket, stick insect, waterbug, beetle, locust, moth and butterfly, scorpion, spider, kingcrab and peripatus.
Mollusca: Various larval stages, T.S. of Unio through gills; Chiton, Doris, Aplysia, Aeolis, Dentalium, Octopus, Loligo, Sepia, Nautilus, Terebratulina, Pecten.
Echinodermata: Various larval stages, T.S. of arm of starfish; Echinus, Ophiothrix, Holothuria, Asteroidea, Antedon.

Study of following with the help of permanent slides/ museum specimens/ models/
Pictures for spotting

5. Study of Parasites:

(a) **Protozoa:** Plasmodium, Monocystis, Trypanosoma, Leishmania, Entamoeba, Giardia.

(b) **Helminthes:** Fasciola, Taenia, Ascaris, Schistosoma and filarial including larval stages.

(c) **Annelida:** Leeches

(d) **Arthropod:** Sacculina, lice, flea, bedbug, tick and mites.

(e) Life Cycle of the following:-

Entamoeba

T. Solium

A. Lumbricoides

F. hepatica

Schistosoma

6. Cytology experiments:

(b) Study of mitosis and meiosis using available material

(c) Study of permanent slides showing stages of cell division, giant chromosome, mitochondria, Golgi body etc.

B.Sc. ZOOLOGY

SEMESTER – I

EXERCISES AND DISTRIBUTION OF MARKS IN PRACTICAL EXAMINATION

The duration of practical will be 3½ hours and distribution of marks will be as following:-

Time: 3½

Max. Marks: 45 (External Examination)

15 (Internal Assessment)*

1. Study of Nervous-system/General anatomy	-	10
2. Identification of spots: (Specimens: 10 and slides: 05)	-	15
3. Permanent preparation	-	05
4. Exercise on life-cycle of parasites	-	05
5. Cytology Experiments	-	05

6. Viva - Voce	-	05
		<hr/>
	Total marks	45
		<hr/>

* **Internal Assessment of 15 marks will comprise of practical records (10 marks), and chart/model (05 marks)**

B.Sc. Zoology : Semester- II

Paper I: Molecular Biology, Elementary Biotechnology and Biological Techniques **MM 60**

Molecular Biology:

Nucleic acids (DNA & RNA): DNA chemistry, nucleosides, nucleotides, polynucleotide chain, Watson and Crick DNA double helix model, identification of genetic material (DNA-as genetic material). RNA-chemistry, genetic and non-genetic RNAs. Elementary knowledge of genetic code. Expression of gene-protein synthesis.

Elementary Biotechnology:

Origin and definition , scope and importance , Restriction enzymes and cloning techniques used in recombinant DNA technology, DNA fingerprinting. Biochips. A Brief knowledge of PCR and its significance.

Biological Techniques:

Introductory knowledge of the application of following biological techniques:

- (a) Photometry (Beer Lambert's law)
- (b) Chromatography
- (c) Electrophoresis
- (d) Microscopy (Phase contrast, TEM, SEM & Fluorescence)

Paper II: Taxonomy, Evolution and Elementary Palaeontology **MM 60**

Taxonomy:

Introduction to taxonomy and systematics, their relationship and significance . Rules of nomenclature- Binomial and Trinomial . Components of classification – Linnean hierarchy. Species concept – species as a category, kinds of species . An elementary idea of taxonomic methodology.

Evolution:

Brief concept and evidences of evolution. Lamarckism, Darwinism, Synthetic theory of evolution, Evolution at Molecular level (Evolution of proteins and nucleotide sequences). Evolution of man.

Palaeontology:

Kinds of fossils and their significance. Formation of fossils. Methods for determining the age of fossils. Geological time scale.

Paper III: Genetics

MM 60

Mendel's life, Pre-Mendelian experiments, symbols and terminologies, Laws of dominance, segregation and independent assortment.

Linkage: Coupling and repulsion hypothesis, Morgan's view of linkage, kinds of linkage, chromosome theory of linkage.

Crossing over: Somatic and germinal crossing over, kinds of crossing over, theories of the mechanism of crossing over, significance.

Determination of sex: chromosome mechanism, Genic balance theory, External environment and sex determination. Hormonal control of sex determination.

Sex linked inheritance: Inheritance of X-linked gene (Colour blindness and haemophilia in man), Sex linkage in *Drosophila*.

Mutation: Historical background, chromosomal mutation (Chromosomal aberrations), gene mutations and their interpretation.

B.Sc. Zoology: Semester-II, Practical's

A complete record of laboratory work will be maintained by every student. The practical work will consist of the following:

1. Biotechnology

- a. Laminar flow
- b. Autoclave
- c. Elisa reader
- d. PCR machine
- e. Refrigerated centrifuge
- f. Transilluminator

2. Genetics

- (i) Experiments on Mendelian and non- Mendelian inheritance.
- (ii) Study of mutants of *Drosophila*.

3. Biological Techniques

Instruments and techniques regarding:

- (i) Photometry
- (ii) Chromatography
- (iii) Electrophoresis
- (iv) Radioimmunoassay

4. Taxonomy and Evolution

- (a) Animal collection techniques:
- (b) Appliances such as cyanide bottle, aspirator, insect nets, fishing nets, Berlese funnel, spreading board.
- (c) Kinds and use of keys.
- (d) Study of evolution of man with the help of Model/chart.

5. **Elementary Palaeontology:** Study of different Era/Periods of Geological Time scale based on charts & models.

B.Sc. ZOOLOGY

SEMESTER – II

EXERCISES AND DISTRIBUTION OF MARKS IN PRACTICAL EXAMINATION

The duration of practical will be 3¹/₂ hours and distribution of marks will be as following:-

Time: 3½

Max. Marks: 45 (External Examination)

15 (Internal Assessment)*

1. Identification of spots. (Application and function of instruments related to Biotechnology)	-	10
2. Biological techniques	-	05
3. Experiments on Mendelian and non-Mendelian inheritance: (Exercises based on Genetics)	-	10
4. Exercises based on Taxonomy and Evolution	-	05
5. Exercise on Palaeontology	-	05
6. Viva - Voce	-	10
		<hr/>
	Total marks	45
		<hr/>

*** Internal Assessment of 15 marks will comprise of practical records (10 marks), and chart/model (05 marks)**

B.Sc. Zoology : Semester-III

Paper I: Lower Chordata

MM 60

Salient features and outline classification (up to order) of various Lower chordate groups as covered under respective taxonomic groups.

Protochordata: Salient features of body organisation and systematic position of *Balanoglossus* and *Amphioxus* as a type and its affinities.

Agnatha: External features of *Petromyzon*.

Pisces: Scales and fins in fishes. Parental care in fishes. Fishes in relation to man.

Amphibia: General characters and affinities of Gymnophiona . Parental care in Amphibia.

Paper II: Higher Chordata

MM 60

Salient features and outline classification (up to order) of various Higher chordate groups as covered under respective taxonomic groups.

Reptilia A brief knowledge of extinct reptiles. Poisonous and non- poisonous snakes. Poison apparatus of snake. Snake venom and anti-venom. Adaptive radiation in reptiles.

Aves: Flightless birds and their distribution. Flight adaptations in birds. Bird migration. Economic importance of birds.

Mammalia: General organisation, distribution and affinities of Prototheria. Economic importance. Adaptive radiation with particular reference to aquatic mammals.

Ecology:

Definition of ecology and its relation to humanity.

The environment: Abiotic factors, biotic factors, edaphic factors.

Concept of ecosystem with reference to pond ecosystem. Energy flow in ecosystem. Pyramids of number, biomass and energy. Food chain- grazing and detritus, Food web and trophic levels. Introduction to the laws of limiting factors (Liebig's law of minimum and Shelford's law of tolerance).

Biosphere: Hydrosphere, Lithosphere and Atmosphere. Biogeochemical cycles: Carbon and Nitrogen cycles.

Population: Definition and characteristics: density, natality, mortality, migration, emigration and immigration, growth and growth-curves. Dispersion and aggregation. Negative and positive interactions including commensalism, mutualism, predation, competition and parasitism.

Environmental Biology:

Biodiversity: Conservation and management of biodiversity. Brief introduction to the concept of protected areas- Sanctuary, National Parks and Biosphere Reserves.

India's wild life habitats (Ecology and distribution of fauna Pressure on India's wild life resources). Adaptations of animals to desert and aquatic life.

Pollution and its control: Air, Water, Soil pollution, Green house effect, Climate change, Acid rain, Ozone layer depletion, Bio-accumulation, Biomagnifications. Control measures to various pollutions.

B.Sc. Zoology: Semester-III, Practical

A complete record of laboratory work will be maintained by every student. The practical work will consist of the following:

Lower and Higher Chordate diversity:

Protochordata: Study of permanent slides of *Amphioxus* and *Balanoglossus* passing through different body regions, *Doliolum*, *Salpa*, *Oikopleura*. Museum specimens of *Herdmania*, *Ciona* and *Balanoglossus*.

Cyclostomata: Museum specimens of *Petromyzon* and *Myxine*.

Fishes: Dissections only with the help of Simulations, charts/models of general anatomy, afferent and efferent branchial arteries, cranial nerves and internal ear of *Scoliodon*. Preparation of permanent slides of ampulla of Lorenzini, placoid, Cycloid and ctenoid scales. Study of permanent slides of shark T.S. passing through different body regions and different kinds of scales of fish. Museum specimens of *Sphyrna*, *Pristis*, *Torpedo*, *Trygon*, *Acipenser*, *Polypterus*, *Hippocampus*, *Exocoetus*, *Anguilla*, *Echeneis*, *Diodon*, *Protopterus*, *Synaptura* and *Chimaera*.

Amphibia: Dissections only with the help of Simulations, charts/models of cranial nerves, hyoid apparatus, brain and columella of frog. Study of museum specimen of *Salamandra*, *Proteus*, *Amphiuma*, *Nectures*, *Siren*, *Ambyostoma*, Axolotl larva. *Rhacophorus*, *Alytes*, *Hyla*, *Pipa* and *Bufo*. Study of skeleton of frog and permanent histological slides of Amphibia.

Reptilia: Study of the skeleton of *Varanus*. Study of museum specimen of following:

Varanus, *Heloderma*, *Hemidactylus*, *Phrynosoma*, *Chameleon*, *Draco*, *Calotes*, Cobra, Pit-viper, Pitless –viper, Rattle snake, Krait, Dhaman, Typhlops and marine snake; Alligator, Crocodile, Gavialis, Turtle and tortoise.

Aves: Permanent preparation of filoplume and down feather. Study of the skeleton of fowl. Study of museum specimens of *Psittacula*, *Corvus*, *Pavo*, *Bubo*, and model of Archaeopteryx.

Mammalia: Dissection only with the help of Simulations, charts/models of the general anatomy and blood vascular system of a mammal. Study of permanent slides of mammals. Study of the skeleton of rabbit. Study of the museum specimens of *Tachyglossus* and *Ornithorynchus* (models) *Pangolin*, *Funambulus*, *Pteropus*, Hedgehog and Loris.

Ecology:

- I. Estimation of the pH of water/ soil sample.
- II. Determination of dissolved oxygen and carbon dioxide in water sample.
- III. Study of adaptations in animals inhabiting different ecological environments.

Environment Biology:

- I. Study of wild animals with the help of stuffed preparations/ models/ charts/ photographs.
- II. Study of indicator organisms of different kinds of water pollution
- III. Simple experiments on the effect of environmental pollution on animals.

B.Sc. ZOOLOGY

SEMESTER – III

EXERCISES AND DISTRIBUTION OF MARKS IN PRACTICAL EXAMINATION

The duration of practical will be 3¹/₂ hours and distribution of marks will be as following:-

Time: 3¹/₂

Max. Marks: 45 (External Examination)

15 (Internal Assessment)*

1. Study of Nervous-system/General anatomy	-	10
2. Identification of spots. (Specimens: 05, slides: 0 2 and bones: 03)	-	10
3. Permanent preparation	-	05
4. Ecology experiments (one)	-	05
5. Experiment on environmental biology/ Wildlife (one)	-	05
6. Viva - Voce	-	10
		45
Total marks		45

*** Internal Assessment of 15 marks will comprise of practical records (10 marks), and chart/model (05 marks)**

B.Sc. Zoology: Semester-IV

Paper I: Developmental Biology

MM 60

Gametogenesis: Spermatogenesis and Oogenesis including structure, differentiation and longevity of gametes. Chemical and metabolic events during gamete formation. Types of eggs.

Fertilization: Significance of fertilization, approximation of gametes, Capacitation, Acrosome reaction, formation of fertilization membrane, egg activation, Blockage to polyspermy.

Cleavage: Patterns, control of cleavage patterns, chemical changes during cleavage, totipotency.

Blastulation and Gastrulation: A complete study in frog and chick; Fate maps, their formation and significance.

Foetal membranes: Their formation and functions in chick.

Retgressive metamorphosis: As exhibited by an ascidian.

Regeneration: Morphallaxis and Epimorphosis, Blastema and its significance, mechanisms as exhibited by invertebrates (*Hydra* and *Planaria*) and Vertebrates (Limb regeneration in Amphibia).

Embryonic Induction: Origin, structure and significance of primary organizer , Nature of inductive signal.

Paper II: Applied Zoology

MM 60

Elementary knowledge of:

- (a) Aquaculture
- (b) Sericulture
- (c) Apiculture
- (d) Lac culture
- (e) Pearl culture
- (f) Piggery

Bionomics and control measures of the common pests of fruits (*Papilio demoleus* and *Quadraspidiotus perniciosus*), Vegetables (*Thrips tabaci* and *Aulacophora foveicollis*) and stored grains (*Callosobruchus chinensis* and *Trogoderma granarium*). Polyphagous insect (Locust and Termites).

Pest management, including insect pest control and integrated pest management.

A note on Bioethics

Paper III: Elementary Entomology and Applied Ichthyology MM 60

Elementary Entomology:

Classification of insects up to orders: Brief knowledge of general characters of following insect orders- Thysanura, Collembola, Orthoptera, Isoptera, Thysanoptera, Herteroptera, Homoptera, Coleoptera, Lepidoptera, Hymenoptera and Diptera and Methods of their collection and preservation.

Parental care in insects. Social life in insects. Insect pollinators.

Applied Ichthyology:

Classification of fishes up to orders.

Integrated fish farming. Carp farming. Snow trout farming.

Construction of aquaria and its maintenance. Ornamental fishes.

Induced breeding.

Indigenous and exotic fishes.

Migration in fishes.

B.Sc. Zoology: Semester-IV, Practical

Developmental biology:

Study of the permanent slides of the chick embryos (whole mounts) and those showing the embryology of frog.

Applied Zoology:

Specimens / slides of Apis, silk moth, Lac insect, phytoparasitic nematodes, major carps. Study of life cycles and control measures of insects of economic importance (Stored grains pests, pest of fruits and vegetables); and study of structural organization of Bee hive. Picture of commercially important varieties of poultry and cattle.

Elementary Entomology and Applied Ichthyology:

Salient features and outline classification (up to order) of various insect groups as covered under respective taxonomic groups.

Salient features and outline classification (up to order) of various fishes as covered under respective taxonomic groups.

B.Sc. ZOOLOGY

SEMESTER – IV

EXERCISES AND DISTRIBUTION OF MARKS IN PRACTICAL EXAMINATION

The duration of practical will be 3½ hours and distribution of marks will be as following:-

Time: 3½	Max. Marks: 45 (External Examination)	15 (Internal Assessment)*
1. Study of Developmental biology	-	05
2. Study of Applied Zoology (Two)	-	10
3. Study of Elementary Entomology(Two)	-	10
4. Study of Applied Ichthyology	-	10
5. Viva - Voce	-	10
	Total marks	<hr/> 45 <hr/>

*** Internal Assessment of 15 marks will comprise of practical records (10 marks), and chart/model (05 marks)**

B.Sc. Zoology: Semester-V

Paper I: Microbiology

MM 60

Introduction to microbiology: kinds of microbes, Typical structure of a bacterium, Gram positive and Gram negative bacteria and virus.

Microbes of medical importance: Bacteriophages, Mycobacterium, Rickettsia, Actinomycetes and Mycoplasma.

A brief knowledge of AIDS.

Environmental use of microorganisms: Nutrient cycle, Metal recovery, petroleum recovery, pest control, waste water treatment and Bioremediation.

Industrial microbiology- Food production, dairy products, fermented food, alcoholic beverages, microbial spoilage, food preservation. A brief knowledge of Antibiotics.

Paper II: Animal Behaviour

MM 60

Patterns of behaviour:

Stereotype innate behaviour: Kinases, Taxes and Reflexes. Concepts of (i) Fixed action patterns (ii) Sign or key stimulus or releasers and (iii) Innate releasing mechanism, Instinctive behaviour.

Learned behaviour: Habituation, Conditioned reflexes, Selective learning, Insight learning, Imprinting, Song learning in birds.

Communication: Chemical, Visual, Auditory, Electric and tactile, Dance language of honey bees, Biological clocks.

Bird migration with particular reference to the mechanisms of navigation.

Introduction to Socio-biology: Social structure in primates

Paper III: Toxicology and Histology

MM 60

Toxicology:

Introduction and brief history of toxicology: General principles of toxicology, Brief history, Environmental toxicology (kinds and sources of toxic agents- animal toxins, plant toxins, pesticides, metals and food additives). Metabolism of toxic substances.

Dose response relationship: Frequency and cumulative responses, determination of TL_m values, Lc_{50} , margin of safety, threshold limits.

Analytical toxicology: Toxic response of blood, organ function tests, teratogenic, reproductive and carcinogenic tests.

Histology:

Histology: Structure of epithelium, connective tissue, cartilage, bone, smooth, striped and cardiac muscles, and nervous tissue as studied under light microscope.

Histological structure of gonads, liver, lung, pancreas and kidney in mammals.

B.Sc. Zoology: Semester-V, Practical

Microbiology:

- (i) Cleaning of glassware and sterilization
- (ii) Preparation of liquid and solid media for cultivation of bacteria

- (iii) Preparation of media for the culture of fungi.
- (iv) Isolation of microorganisms from soil.
- (v) Gram staining of bacteria
- (vi) Micrometry of microorganisms

Animal behaviour:

Study of different kinds of behaviour with the help of photographs.

Toxicology:

Calculation of LC₅₀ with the help of data provided. Study of behavioural responses (in fish, insects or any other locally available animal) to some important toxicants.

Histology:

Study of the permanent slides of cartilage, bone, epithelium, connective tissue, nervous tissue, blood, striped and unstriped muscles, liver, kidney, lungs, pancreas, pituitary, thyroid, and adrenal of mammals. Preparation of smooth and striped muscles.

B.Sc. ZOOLOGY

SEMESTER – V

EXERCISES AND DISTRIBUTION OF MARKS IN PRACTICAL EXAMINATION

The duration of practical will be 3½ hours and distribution of marks will be as following:-

Time: 3½

Max. Marks: 45 (External Examination)

15 (Internal Assessment)*

1. Microbiology Experiments (Two)	-	10
2. Study of Animal behaviour (Two)	-	10
3. Study of Toxicology (One)	-	05
4. Study of Histology (Five)	-	10
5. Viva - Voce	-	10
		<hr/>
Total marks	-	45
		<hr/>

*** Internal Assessment of 15 marks will comprise of practical records (10 marks), and chart/model (05 marks)**

B.Sc. Zoology: Semester-VI

Paper I: Biological Chemistry and Basic Mammalian Endocrinology

MM 60

Biological Chemistry:

Introduction to biological molecules: Proteins, Amino acids, Carbohydrates, Lipids, Vitamins and Enzymes- their structure, classification and significance. Metabolism of Carbohydrates.

Endocrinology:

General characteristics of endocrine system, mechanisms of hormone action (cellular and sub cellular). A brief knowledge of the structure and hormonal functions of the glands namely, Pituitary, Thyroid, Pancreas, Adrenal, Testis and Ovary. Elementary knowledge of the etiology of Dwarfism, gigantism, acromegaly, diabetes insipidus , Goitre, Cretinism, Myxoedema, Diabetes mellitus and Addison's disease.

Paper II: Animal Physiology

MM 60

Nutrition: Food constituents, intracellular and extracellular digestion, Digestion and absorption of carbohydrate, fat and protein.

Respiration: Pulmonary ventilation, respiratory pigments, gaseous transport and control of respiration.

Excretion: Concept of ammonotelic, ureotelic and guanotelic animals, urine formation in mammals.

Blood vascular system: Haemopoiesis, composition and functions of blood, blood coagulation. A brief account of immunity. Types of heart, origin and conduction of heart beat.

Nervous system: Resting and action potential of nerves, synapse and transmission of nerve impulse.

Muscular system: Muscle contraction and its Mechanism. A brief idea of tetanus and fatigue.

Paper III: Bioinformatics and Biostatistics

MM 60

Bioinformatics:

Elementary knowledge of computer: Organisation of computer, input and output devices, elementary idea of software, hardware and programming languages.

Use of computers in biological sciences: Sequence, structure and strain databases and their use.

Biostatistics:

Biostatistics as a tool in research, Data collection- Random and non-random sampling, data tabulation and data presentation (Graph, Histogram, Scatter diagram), Concept of mean, mode, median and of standard deviation and standard error.

B.Sc. Zoology: Semester-VI, Practicals

Physiology / Biochemistry:

- (i) Preparation of haemin crystals from human blood
- (ii) Determination of clotting and bleeding time
- (iii) Counting of RBCs in human blood
- (iv) Counting of WBCs in human blood
- (v) Determination of haemoglobin percentage in human blood
- (vi) Qualitative identification of carbohydrate, protein and lipid.
- (vii) Analysis of urine for identification of sugar, albumin, ketone bodies, etc.
- (viii) Study of the action of salivary amylase on starch.

Endocrinology: Study of endocrine glands and related disorders with the help of slides/photographs/ charts/ models.

Biostatistics:

- (i) Calculation regarding mean, median, SD and SE from given data.
- (ii) Preparation of histogram and pie diagram with the help of data provided.

Bioinformatics: Brief knowledge of computer and its application.

B.Sc. ZOOLOGY

SEMESTER – VI

EXERCISES AND DISTRIBUTION OF MARKS IN PRACTICAL EXAMINATION

The duration of practical will be 3¹/₂ hours and distribution of marks will be as following:-

Time: 3¹/₂

Max. Marks: 45 (External Examination)

15 (Internal Assessment)*

1. Experiment on Physiology	-	10
2. Experiment on Biochemistry	-	10
3. Endocrinology	-	05
4. Exercise on Biostatistics	-	05
5. Bioinformatics	-	05
6. Viva - Voce	-	10
Total marks		<hr/> 45 <hr/>

*** Internal Assessment of 15 marks will comprise of practical records (10 marks), and chart/model (05 marks)**