

DEPARTMENT OF ZOOLOGY

PROGRAMME: M.SC.

Statement of Course Outcomes (COs)

M.SC. SEMESTER I

Paper 1T1

Structure and Function of Invertebrates

On completion of the course, students will be able to understand:

- Classical and molecular taxonomy.
- The Ultra structure of locomotary organelles, mechanism of locomotion in protozoans.
- The dermal cells and skeletal organization in sponges.
- Polymorphism and metagenesis in coelenterate
- Theories of origin of metazoa.
- Reproduction in helminthes.
- Formation, evolution and significance of coelom .
- Excretion in annelida.
Peripatus as connecting link between annelida and arthropoda.
- Respiration in arthropoda.
- Neopilina (monoplacophora): structure, affinities and taxonomic position.
- Neuroanatomy in gastropoda, bivalvia and cephalopoda.
- Echinodermata- water vascular system and larval forms.
- General account and affinities of ctenophora and rotifera.
- General account and affinities of entoprocta and ectoprocta.

Paper-IT2,

General Physiology

On completion of the course, students will be able to understand:

- Enzyme- Classification, its action and regulation.
- Respiratory pigments- types, distribution and properties, structure and mechanism of O₂ transport. .
- Physiology of Neurotransmitters, Colour change ,Bioluminescence, Thermoregulation, osmoregulation.
- Molecular mechanism of hormonal action, membrane receptors and signal transduction.
- Types of heart (myogenic and neurogenic), cardiac cycle.
- Classification and metabolism- carbohydrates , lipids, proteins
- Hydromineral metabolism.
- Cerebrospinal fluid: chemistry and functions.
- Mechanism of reflex action.
- Physiology of environmental stress and strain.

Paper-IT3

Cell Biology and Genetics

On completion of the course, students will be able to understand:

- The structure and function of : cell membrane ,cell organelles, microfilaments, microtubules.

- Cell division and cell cycle.
- Cell signaling , signal transduction pathways, cellular communication and cancer.
- Inheritance- mendelian, non-mendelian; extensions of mendelian principles ; quantitative genetics and mutation.
- Alterations of chromosomes and their genetic implications.
- Extra chromosomal inheritance.
- Microbial genetics and human genetics.

Paper-IT4

Advanced Reproductive Biology

On completion of the course, students will be able to understand :

- Methods of reproduction in protozoa.
- Regeneration in hydra, digesia and annelid worms; morphogenesis and hormonal control.
- Mechanism of vitellogenesis and metamorphosis in insects
- Spermatogenesis, mechanism of oogenesis, cytological and molecular events of fertilization.
- Embryology- types of cleavage, blastulation, gastrulation and embryonic induction.
- Male accessory sex glands in mammals.
- Semen, sperm capacitation and decapacitation
- Pheromones and sexual behavior in mammals
- Neurohormonal control of fish reproduction and mechanism of vitellogenesis.
- Molecular induction , cryopreservation ,test-tube baby , in vitro fertilization (ivf) and its significance.

Practical-IPI

Structure and Function of Invertebrates and General Physiology

Section A

On completion of the course, students will be able to

- Classify the animals of all phyla.
- Describe the
- Digestive system of Earthworm, Leech, Cockroach, Silkworm and Honey bee
- Nervous system of Prawn, Cockroach, Silkworm and Honey bee and
- Reproductive system of Earthworm, Leech, Cockroach and Honey bee.
- Prepare Whole mount preparation of plankton.
- Describe the
 - Earthworm – Nerve ring, ovary, spermatheca, nephridia.
 - Leech – jaws, ciliated organ.
 - Cockroach – Mouth parts, Salivary glands, trachea.
 - Prawn –Appendages, Statocyst.
 - Protozoans- rhizopods , flagellates , ciliates (fresh water forms).
 - Porifera – Spicules and gemmules of fresh water sponges.
 - Crustaceans and rotifers - Planktonic copepodes, cladoceran, ostracoderm and rotifers.
 - h. Larval forms of the free living & parasitic invertebrates.

- From the Study of permanent Invertebrate slides, Students can describe :
- larval forms of Coelenterata, Arthropoda , Mollusca, Echinodermata and Hemichordata.
- anatomy and histology of invertebrates.

Section B

Physiology experiments

On performing experiments students will be able

- To counts R.B.C. and W.B.C and haemoglobin concentration.
- Demonstrate the action of salivary amylase, trypsin, pepsin.
- Demonstrate the rate of O₂ consumption in aquatic animals, under various environmental stresses.
- Estimate sodium, potassium, glucose, total blood proteins cholesterol and chloride in blood.

Practical- 1P2

Section-A

Cell Biology, Genetics and Advanced Reproductive Biology

On completion of the course, students will be able to:

- Study mitotic metaphasic chromosomes & prepare human karyotypes..
- Demonstrate and identify Barr body in human female leucocytes.
- Identify polytene chromosome in dipteran larvae .
- Solve the Problems on genetics based on monohybrid/dihybrid ratios, sex linked inheritance and blood groups.
- Describe various human genetic traits.

Section-B

On completion of the course, students will be able to:

- Identify and describe meiotic chromosomes and spermatogenesis
- Describe the oogenesis in earthworm/ fish/ rat ovary
- Perform Semen analysis: its physical viscosity, pH, liquefaction time, agglutination test, motility and sperm count and its Hypo-osmotic swelling (HOS)
- Prepare vaginal smear in rat by temporary mounting (methylene blue) and study it.
- Study and describe the Histology of male and female reproductive organs and accessory reproductive glands.

M.SC. SEMESTER-II

Paper- V

Structure and Function of Vertebrates

On completion of the course, students will be able to explain:

- The origin and ancestry of chordate, General organization and affinities of Cephalochordata.
- Vertebrate's- integument , Sense organs , Autonomous nervous system,
- Evolution of urinogenital organs & heart .
- Comparative anatomy in vertebrates -the brain, Appendicular skeleton.
- Organs and mechanism of respiration in Amphibia, Structure, development and metamorphosis of Amoecoetus.
- General characters and affinities of Dipnoi.
- General body organization and classification in Chelonia.

- Origin of Birds.
- Cetacea: general characters and adaptations, Evolution of Man.

Paper-VI

Comparative Endocrinology

On completion of the course, students will be able to explain:

- Hormones and functions in Coelenterata , Helminths, & Echinodermata. structure, hormones and functions of Neurosecretory system in Annelida & Mollusca
- Neuroendocrine system , structure and hormones, Endocrine control of metamorphosis reproduction and colour change mechanisms in crustaceans & insects.
- Structure, hormones and functions of Pineal organ, Hypothalamo hypophysial system, Pituitary, Thyroid, Parathyroid ultimobranchial glands, Gastro-entero-pancreatic endocrine system, Adrenal gland .
- Gonadal hormones in vertebrates and their hormonal actions, feedback mechanisms.

Paper VII

Molecular Biology and Biotechnology

On completion of the course, students are able to explain

- DNA- Cot $\frac{1}{2}$ and Rot $\frac{1}{2}$ values, organelle genome, structure, forms. replication & regulation of replication.
- Different mechanism of DNA damage and repair .
- Prokaryotic and eukaryotic transcription ,its Regulation ,translation, post translational modifications.
- Mobile DNA elements .
- Antisense and ribozyme technology .
- Isolation and sequencing of DNA, gene amplification.
- Splicing and Cloning.
- Hybridization techniques & microarray.
- Biotechnology- Medical, Agricultural , Industrial , Environmental & Immunobiotechnology.

Paper VIII

Advanced Developmental Biology

On completion of the course, students are able to explain

- Mammals-Implantation, Foetal membranes, Placental Hormones , Multiple ovulation and embryo transfer technology (MOET), Application of embryonic stem cells, significance. Embryonic sexing, cloning, screening for genetic disorder diagnosis (ICSI, GIFT etc.), Immunocontraception & Classical contraceptive techniques ,
- Role of mutants and transgenics in human welfare.
- Metamorphosis in Amphibia.
- Regeneration in vertebrate, Apoptosis, Ageing.
- Polymorphism in insect .
- Cloning of animals by nuclear transfer.

Practical III
Structure and Function of Vertebrates and Comparative
Endocrinology
Section-A

On completion of the course, students will be able to:

- Explain classification of vertebrates .
- Explain Anatomy of Fish/ Rat. a) Brain and cranial nerves b) Arterial and venous systems c) Urinogenital system d) Reproductive systems e) fish- Internal ear ,Weberian ossicles , accessory respiratory organs.
- Permanent Stained preparation of fish scales, ampullae of Lorenzini, otolith, striated muscles and cartilage .
- Understand the technique of Microtomy.
- Explain skeleton of fowl and rabbit.

Section-B

- Histological study of endocrine glands .
- Anatomical Observations of the endocrine glands of Cockroach and fish/rat.

Practical IV
Molecular Biology, Biotechnology and Developmental Biology
Section-A

On completion of the course, students are able to :

- Demonstrate DNA(Feulgen's reaction)DNA: RNA(Methyl Green- Pyronin reaction),
- Demonstrate of carbohydrate(PAS reaction), Lipid(Sudan Black B staining) , Protein(HgBP staining).
- Histochemical analysis of alkaline phosphatase ,acid phosphatase
- Biochemically estimate sugar (O-toluidine method) , protein(Lowrey's method) , DNA (Diphenylamine method) & RNA (Orcinol method) .
- To perform tests for qualitative analysis of saliva & bile.
- Demonstrate separation of amino acids by paper chromatography and TLC
- Study of the reproductive system in mammals, types of eggs , different types of placenta .
- Study of the developmental stages of live eggs of Lymnea or any gastropod , insects/ fishes, Frog.
- Study of developmental stages of chick through slides and whole mounts. Chick embryo mounting by window method.
- Sperm count from any domestic animal

M.SC. SEMESTER III

Paper- 3T1
Parasitology and Immunology

Under this paper the students will study:

- The study of the relationship between **parasites** and their hosts.
- Students will understand various **important** diseases of human, animals and even plants caused by the parasites.
- Knowledge in **parasitology will also** helps in the manufacturing of drugs to combat **parasites** infections.

- Immunology is an incredibly exciting and broad area of the biomedical sciences where the students will understand the ways animals react to organ transplantation and to infectious agents such as viruses, bacteria, fungi and parasites.
- To understand cell growth and differentiation and how immune responses function.
- The critical role of immunology and immunotherapy play in combating disease and how ultimate survival in today's world is viewed more and more as being dependent on having, protecting and restoring a strong human immune system.

Practical-3P1

Parasitology and Immunology

In this practical the students completing the course, are able to:

A) Parasitology :

- Study different types of parasitic protozoan's ,parasitic helminthes,insect vectors with the help of already available permanent slides/ ICT tools/ Models/ Charts/ Photographs etc.
- Identify and study of various ecto and endo parasites with the help of already available permanent slides/ ICT tools/ models/ charts/ photographs etc.
- 3.Study different types of insect vectors and their mouth parts with the help of already available specimens, permanent slides
- Study of life cycles of various parasites with the help of already available specimens, permanent slides/ ICT tools/ models/ charts/ photographs etc.
- Demonstrate Gram positive and Gram negative bacteria.
- B) Immunology :
- Demonstration of immunoelectrophoresis.
- Immunological diagnosis of pregnancy.
- Preparation of tissue sections of thymus, spleen, and lymph nodes. (Source of tissue: Animal wastes from local recognized slaughter houses/ poultry farms/ fish markets etc.)
- Identify and study T and B cells with the help of already available permanent slides/ ICT tools/ models/ charts/ photographs etc.
- Demonstration of Mast cells. (Source of tissue: Animal wastes from local recognized slaughter houses/ poultry farms/ fish markets etc.)
- Demonstration of Ouchterlony double diffusion (ODD).

Paper-3T2

Special Group-Mammalian Reproductive Physiology -I

Reproductive Process in Male

In this special paper the students on completion of the course, are able to:

- Understand the Structure , functions of Sertoli cells, Leydig cells ,Epididymis and sperm.
- Students will understand Spermatogenesis(Molecular changes, hormonal regulation), and spermiogenesis., Sperm capacitation: molecular and biochemical changes, decapacitation.
- Understand the Structure and function of Vas deferens, Seminal Vesicle: Structure, function and regulation, Prostate gland: Structure, function and prostatic cancer, Cowpers gland: Structure, function and anomalies. And Penis: Structure and mechanism of erection.

- Male reproductive behaviour: Mating system, neural and hormonal control.,Pheromones: types, structure and function. and Infertility: causes and remedy.
- Anthropologically relevant diseases in advanced age.

Paper-3T3

Special Group-Mammalian Reproductive Physiology-II
Reproductive Process in Female

In this special paper the students on completion of the course, are able to

- study the differentiation of the ovary and female genital tract. The process of folliculogenesis and its hormonal control and signalling for ovulation.
- To understand the Oestrous cycle in mammals, Menstrual cycle and Menopause in female 2 Mechanism and hormonal control of ovulation
- Histology and function of Corpus luteum and structure, regional differentiation and function of Oviduct, Uterus: Types, abnormalities.
- Understand the structure, functions of cervix andVagina .Also detection of various stages of oestrous cycle by vaginal cytology, vaginal plug. Onset of puberty and delayed puberty.
- To study the role of Prostaglandins in reproduction, Anatomy and growth of mammary Glands and Lactogenesis and galactopoiesis.

Paper-X

Special Group-Cell Biology -I

Under this paper the students will be able to:

- To understand the working and applications of various microscopy techniques This will be helpful to them in R & D jobs.
- Students will acquire knowledge of Basic principles , applications and working of various types of centrifuges, Spectroscopy and Chromatography technique used in biophysics.
- Understand the Cell culture techniques and will learn to design and functioning of tissue culture laboratory.
- Students will learn tissue engineering, Enzymology of recombinant DNA technology , Cloning vectors, Gene probes and Gene library – Construction
- Understand gene cloning and its application, detecting DNA polymorphism, DNA chip technology.

Paper-XI

Special Group-Cell Biology-II

Under this paper the students will be able :

- Understand the Chromosome structure , classification ,Chromosomal mutations and Structural abnormalities of human chromosomes and related syndromes:
- To understand Human metabolic disorders,Molecular methods of chromosome studies and applications – in situ hybridization, FISH., Genome organization

- Understanding about Functional genomics, Molecular cytogenetic, DNA sequencing, microarray.
- Students will understand Developmental genetics, Cell specification and determination–Role of segmentation genes,
- To learn Population genetics ,Genetic selection ,Speciation and isolating mechanisms.

Paper-X,
Special Group-Fresh water Zoology -I
Limnology

Under this paper the students will be able :

- To understand the dynamics of Aquatic Ecosystems, Energy flow models,LoticHabitat,Lentic Habitat .
- Understand the physical and Chemical conditions of water.
- To learn the Primary and secondary productivity in aquatic ecosystems, Classification of waterbodies based on productivity ,Methods of measurement of productivity and Factors affecting primary productivity and significance of productivity studies.

Paper-XI
Special Group-Fresh water Zoology-II
Fishery Biology

Under this paper the students will be able :

- To learn the Schemes of classification of fishes by Berg (1940) and Romer (1971)
- Biology of Indian major carps and culturable exotic carps ,Food and feeding habits of some common fresh water fishes. AlsoMethods of gut content (food) analysis.
- Understand the Structure and function of gills. Electroreceptors in fishes ,Growth and age studies on fish
- To understand maturation, spawning periodicity and fecundity of fish. Also Genetic engineering methods for fish stock improvement.
- Understand Fish diseases caused by pathogens and parasites.
- Aquarium-fish keeping and its maintenance ,ornamental fishes , Exotic and larvivorous and Threatened fresh water fishes and conservation measures.

Practical-VI
Special Group- Fresh water Zoology

In this practical the students completing the course, are able to:

Section A

- Measurement of transparency of water body by Secchi disk method.
- Analysis of pH & Turbidity of water.
- Estimation of Dissolved Oxygen (DO) & free carbon dioxide from water.
- Estimation of Alkalinity (Carbonates & Bicarbonates), Hardness (Total, Ca & Mg)
- Estimation of Chlorides, Phosphates & Nitrates from water. 6 Biochemical oxygen demand (BOD) from given water sample.
- Determination of primary productivity of a water body by light and dark bottle method.

Section: B

- Identification of commercially important freshwater fishes and prawns using fishes available in local recognized fish markets or with the help of already available specimens/ ICT tools/ models/ charts/ photographs etc.
- 2, Morphometric study of fish available in local recognized fish markets or with the help of already available specimens/ ICT tools/ models/ charts/ photographs etc.
- Study of spawning periodicity by provided data.
- Determination of length - weight relationship of fish available in local recognized fish markets or with the help of already available specimens/ ICT tools/ models/ charts/ photographs etc.
- Determination of condition factor by using given data.
- Study of maturity stages of fish by using pictures.
- Histological study of fish organs with the help of already available permanent slides/ ICT tools/ charts/ Models / Photographs etc.
- Identification of common parasites of fish with the help of already available permanent slides/ ICT tools/ charts/ models / photographs etc.
- Permanent mounting of fish scales using wastes from local recognized fish markets.
- Visit to a fresh water body for the study of aquatic ecosystem.

Paper XII

Core (Subject centric)-I Wild life and Avian Biology

Under this paper the students will study:

- Wild life sciences that seeks to meet the increasing demand for research and monitoring of wildlife and their habitats and provide trained biologist to further do research in wildlife conservation.
- Student with wildlife course are also free to join different streams like in entomology, foresters, as a zoo curator, in wildlife department , as a conservationist etc.
- Wild life sciences has also another employment area for the students like in sanctuaries, National parks, Wildlife research centres, Environmental monitoring centres etc.
- Avian biology is a new field which allows one to pursue the fascination about birds through the study of topics like physiology, anatomy, nutrition, behaviour etc.
- Study of avian biology has world wide job opportunities that involve domestication of pets, commercial poultry industry, research institute and bird sanctuaries and zoos.

M.SC. SEMESTER-IV

Paper-XIV

Special Group-Mammalian Reproductive Physiology-III

Reproductive Endocrinology

Under this paper the students will be able :

- Understand the Anatomy, cytoarchitecture of Hypothalamus , Neurotransmitters and Feedback regulatory mechanism
- To learn Anatomy and cytology of Pituitary Gland and its hormones.
- To understand the Hypothalamo – hypophyseal testis axis, Thyroid -gonad axis and Hypothalamo- hypophyseal adrenal-gonad axis.

Paper-XV

Special Group-Mammalian Reproductive Physiology-IV

Reproductive Toxicology, Embryology and Fertility

- Students will learn Chemical toxicants and Testicular toxicity, Induction of gonadal toxicity in females and Interruption of pregnancy by pesticides.
- Students will understand Implantation of mammalian blastocyst, chorio-allantoic placenta, Foetal membranes.
- Intrauterine and intra cervical devices (IUDS and IUCDS) medicated and non medicated IUD's, Pregnancy vaccine, Recent advances in female contraception.
- Vasectomy and reversible vas occlusion antagonist, Anti-androgen and anti-spermiogenic compounds

Practical-VII

Special Group-Mammalian Reproductive Physiology

- Demonstration of surgical operation in rat/ mice Ovariectomy or Hysterectomy or Unilateral adrenalectomy with the help of ICT tools/ Charts/ Models / Photographs etc
- Anatomical observations, demonstration and detailed explanation of the female reproductive system of rat or mice with the help of ICT tools/ models/ charts/ photographs etc
- Vaginal smear: Vaginal cytology with relation to estrous cycle with the help of already available permanent slides/ ICT tools/ charts/ models/ photographs etc.
- Pregnancy detection test.
- Study of histochemical localization of proteins in rat/ mouse thyroid by Mercury Bromophenol blue method with the help of already available permanent slides/ ICT tools/ charts/ models/ photographs etc.
- Study of histochemical localization of lipids in rat / mouse ovary by Sudan Black-B method (Propylene glycol method) with the help of already available permanent slides/ ICT tools/ charts/ models/ photographs etc.
- Experimental (histological slides for identification) study of the following with the help of already available permanent slides/ ICT tools/ charts/ models/ photographs etc. a) Effects of ovariectomy and oestrogen replacement on pituitary, uterus and vagina. b) Effects of some female antifertility drugs on ovary and adrenal gland
- 8 Histology: (Identification of slides) Histological changes in female reproductive organs during different phases of oestrous cycle in continuous and seasonal breeder with the help of already available permanent slides/ ICT tools/ charts/ models/ photographs etc
- Embryology: Study of various stages of development of mammalian egg, development of foetal membranes, different types of placenta, progestational changes in uterus with the help of already available permanent slides/ ICT tools/ charts/ models / photographs etc.
- 10 Field work: Visit to laboratory for embryo transfer and family planning clinics.

Paper-XIV

Special Group-Cell Biology-III

Molecular Cell Biology

Under this paper the students will be able :

- To understand the Prebiological chemical evolution and proto cells.
- Cytoskeleton , Cell-cell interactions and adhesion, Cell-matrix interactions and adhesions and Types of junctions.
- Protein structure , Ramchandran plot . Molecular chaperons and heat shock proteins.
- Understand Protein synthesis in eukaryotes., Transport of proteins across nuclear membrane.
- To study DNA binding proteins – Leucine zipper, zinc finger, helix turn helix, beta barrel and OB fold.
- Understand Types of cancer, Proto-oncogenes and viral oncogenes, Mechanism of oncogene activation. 3.4 Tumor markers and tumor suppressor genes.
- Model organisms for molecular studies –Importance of Drosophila melanogaster, C. elegans, S. cerevisiae, zebra fish studies, Cell senescence and apoptosis.
- To learn Somatic cell hybridization and chromosome mapping, Cell fusion and applications.
- To understand Protein and tissue engineering.

Paper-XV,

Special Group-Cell Biology-IV

Applied Biotechnology

Under this paper the students will be able :

1. Marker assisted improvement of crop , Recent developments in drug delivery.

Nanobiotechnology and biological warfare.

- To learn Biology, cause, diagnosis and treatment of various diseases like hepatitis, Parkinson's disease, diabetes and cystic fibrosis.
- To learn Properties of stem cells ,Types of stem cells, Haemopoiesis, Stem cell disorders. Stem cell therapy, Stem cell and cancer, Stem cell research in India.
- Stem cells and tissue engineering, ethical, legal and social implications (ELSI) of Stem cell technology.
- World Trade Organization and trade related intellectual property rights (TRIPS), . Intellectual property rights – Patents and patent documentation.

Practical-VII

Special Group-Cell Biology

- Measurement of maximum absorption of colored solutions & verification of Beer Lambert's law.
- Biochemical estimation of blood cholesterol & blood glucose, (Source of blood: Local recognized pathology laboratory)
- Biochemical estimation of acid phosphatase and alkaline phosphatase (Source of blood: Local recognized pathology laboratory)
- Isolation of lymphocytes.
- Comparison of RBC and WBC in different group of vertebrates with the help of already available permanent slides/ ICT tools/ Charts/ Photographs etc.
- Media preparation for prokaryotic cell culture Methods of Sterilization
- Gram staining of micro-organisms. And Bacterial motility.
- Preparation of neem extract as an antimicrobial agent.

- Separation of amino acids by paper chromatography.
- Uses and functioning of different types of microscopes.
- Study of metaphase chromosomes from rat bone marrow with the help of already available permanent slides/ ICT tools/ charts/ models etc.
- Study of G banding of metaphase chromosome with the help of already available permanent slides/ ICT tools/ charts/ models / photographs etc.
- Study of C banding with the help of already available permanent slides/ ICT tools/ charts/ models/ photographs etc.
- Study of histology of normal tissue and cancerous tissue with the help of already available permanent slides/ ICT tools/ charts/ models / photographs etc.
- Demonstration of tools used for patent search and patent filing system.

Paper XIV

Special Group-Fresh water Zoology-III

Aquatic Biology

Under this paper the students will be able :

- To understand about Plankton , Periphyton , Nekton(Definition,classification,Collection,preservation and Qualitative and quantitative study, importance)
- To understand the Bottom material,Benthos (Definition and collection of benthos. Qualitative and quantitative study,Importance)
- To learn about Aquatic pollution, types & sources of pollutants.Methods of assessment of pollutional status. 2.2 Biological indicators of pollution.
- Understand Heavy metal and pesticide residues from agriculture fields & control measures.
- Drinking water treatment and Disposal of sewage.
- Aquatic toxicology: Toxicants, toxicity concentration response relation and Bioassay study

Paper XV

Special Group-Fresh water Zoology-IV

Inland Fisheries

Under this paper the students will be able :

- To learn Inland fisheries resources ,Fresh water fish culture and management techniques.
- To make Basic experimental designs useful in aquaculture and Population dynamics of fish and stock assessment models.
- Types of Breeding natural& synthetic hormones in breeding.
- Types of Hatchery , Nutritional requirement of carps and supplementary feeding.
- To learn different types of fish cultures, Integrated fish farming with agriculture and live stock. Culture of fresh water mussel for pearls.
- Fisheries extension and Co-operative societies. ,Biochemical composition and economic importance of fishes,Fish spoilage & preservation methods, and HACCP in processing industry

Practical-VII

Special Group- Fresh water Zoology

Section: A

- Qualitative and Quantitative study of fresh water zooplankton.
- Study of fresh water periphyton.
- Study of fresh water benthic organisms with the help of already available permanent slides/ ICT tools/ charts/ models / photographs etc.
- Study of LC50 value of toxicant to aquatic organism by provided data.
- Methodology of oxygen consumption rate of aquatic organisms.
- Camera lucida drawings of zooplankton.
- Study of ecological set up.

Section: B

- Feed formulation by square method.
- Estimation of Maximum sustainable yield (MSY) using surplus production model.
- Study of preparation of pituitary extract with the help of ICT tools/ charts/ models / photographs etc.
- Identification of aquatic weeds, insects and weed fishes with the help of already available permanent slides/ ICT tools/ charts/ models / photographs etc.
- Gram staining of bacteria.
- Estimation of protein (Source of blood: Local recognized pathology laboratory)
- Determination of acid value or free fatty acids (FFAs) in fish oil.
- Identification of egg, spawn, fry & fingerlings of carps with the help of already available permanent slides/ ICT tools/ charts/ models/ photographs etc.
- Estimation of trend by using given data with the help of time series analysis. 10. Visit to a fish farm for studying the culture and breeding activities.

Paper-XIII

Biotechniques, Biostatistics, Ethology, Toxicology and Bioinformatics

Under this paper the students will be able:

- To understand various Sterilization techniques, media for microbial culture, inoculation methods
- Animal cell & tissue culture will be learned by the students.
- To understand Basic principle of sedimentation and centrifugation, Chromatography, and Electrophoretic separation techniques
- Students will learn Biostatistics : Central tendency ,dispersion- mean, mode and median ,Probability , standard error (SE), standard deviation (SD), significance tests - t- test, z- test, Chi square test- assumption, importance and example
- 5.To understand animal behaviour and Animal ethics.
- Understand scope of toxicology , Classification of environmental toxicants; Pesticides, Fertilizers, Heavy and trace metals, radioactive substances, food additives, automobile emission. Toxicity tests- Types (Acute and Chronic), calculation of LC50 and LD 50;
- Antidotal therapy- Antidotes, type of antidotes and antidotal procedure.
- Students will learn scope of bioinformatics - history, scope of bioinformatics in research, business and employment opportunities; Bioinformatics in India. biological databases– Basic local alignment search tool (BLAST), and FASTA, Variants of

BLAST, PSI-BLAST. And Phylogenetic analysis- Tree style, tree building methods

Paper- 4T4

Radiation and Chronobiology

Under this paper the students will be able:

- To understand Radiation Biology(Definition, scope , Classification , and significance of radiation).
- Principles of radiation dosimetry, direct and indirect effects. Radiations lesions in DNA, radiobiological effect on cell.
- Effect of Radiation on Human Health
- To understand effect of Radiation in the developing embryo and fetus, radiation induced heritable diseases.
- To study Circadian cycle, Concept of central and peripheral clock system,Circadian pacemaker system in invertebrates with particular reference to Drosophila ,rodents.
- Biological clock ,Centers of biological clock – Supra chiasmatic nuclei, pineal gland and optic lobes. Depression and sleep disorders.
- To study Chronopharmacology, chronomedicine, chronotherapy.