

**TEACHING PLAN**  
**ZOOLOGY -HONOURS 2016-17, 2017-18**  
**PART - I**  
**(PAPER 1: UNIT I)**

<b>Diversity &amp; Functional Anatomy of Non-chordate &amp; Chordate Forms</b>	<b>Teacher</b>	<b>Class Hour</b>	<b>Teaching Method</b>
<b>Group A: Non chordate</b>			
Animal architecture and Bauplan concept	SB	2	Theoretical
Classification up to Phylum of Protozoa	SB	2	Theoretical
Movement: Ameoboid movement	SB	3	Theoretical
Reproduction in Paramoecium sp. with special reference to conjugation	SB	3	Theoretical
Canal system in Porifera	SK	2	Theoretical
Polymorphism in Siphonophores and its evolutionary significance	SK	2	Theoretical
Coral reef: Types, distribution in India and conservation aspects	SK	2	Theoretical
Metamerism in Annelida and its evolutionary significance	SB	2	Theoretical
Respiration: Terrestrial respiration in Periplaneta	SB	4	Theoretical
Nervous system in Pila and effect of torsion on it. Nervous system in Aplysia and effect of detorsion on it.	SB	4	Theoretical
Water vascular system in Asterias sp.	SB	3	Theoretical
Structural organization of Placozoans	SB	2	Theoretical
<b>Group B: Chordate</b>			
Basic body plan in chordates. Basic concept of chordate classification. Classification up to living Subclass of Fish and Aves; up to living Order of Amphibia and Reptilia; up to Infra-class of Mammals	SB	4	Theoretical
Structure of pharynx and feeding mechanism in Branchiostoma sp	SK	2	Theoretical
Metamorphosis in Ascidia – justification in the light of survival of the species	SB	2	Theoretical
Comparative anatomy & structural organization of aortic arches in vertebrates	SK	2	Theoretical
Accessory respiratory structure in teleosts	SK	2	Theoretical
Paedomorphosis with special reference to Axolotl larva	SB	2	Theoretical

Non-poisonous and poisonous snakes; Poison apparatus and biting mechanism of poisonous snake	SK	3	Theoretical
Distinguishing features of Ratites and Carinates	SK	2	Theoretical
Feather of Birds – its type, development, structure, colour variations as adaptive feature and function	SK	2	Theoretical
Exoskeletal structure in Mammals – hair, horns and antlers	SK	4	Theoretical
Distinguishing features of Artiodactyla and Perissodactyla	SK	2	Theoretical
Functional anatomy of ruminant stomach in cow	SK	2	Theoretical
<b>Total Marks -50</b>			

### PAPER 1, UNIT II

Cell Biology and Genetics	Teacher	Class Hour	Teaching Method
<b>Group A: Cell Biology</b>			
Principles of microscopy	SK	2	Theoretical
Cell Membrane	SK	2	Theoretical
Mitochondria	SK	4	Theoretical
Endo membrane system of cell:	SK	2	Theoretical
<b>GROUP B: GENETICS</b>			
Properties of DNA	SB	2	Theoretical
Concept of genetic information:- DNA Repl ication, Transcription in prokaryotes and eukaryotes, RNA processing, Protein synthesis in prokaryotes	SB	6	Theoretical
Allele concept	SK	2	Theoretical
Linkage	SK	2	Theoretical
Crossing over	SK	2	Theoretical
Mutation:- Types, Mutagens and their effects, Mutation detection	SB	4	Theoretical
Sex determination in Drosophila and Human	SB	4	Theoretical
Dosage compensation:- In Drosophila, In human	SB	3	Theoretical
Chromosomal Aberration	SB	4	Theoretical
Cytoplasmic inheritance	SB	2	Theoretical
<b>Total Marks -50</b>			

**PAPER 2, UNIT I**

<b>DEVELOPMENTAL BIOLOGY</b>	<b>Teacher</b>	<b>ClassHour</b>	<b>Teaching Method</b>
Gametogenesis: Spermatogenesis & Oogenesis.	SB	2	Theoretical
Ultra structure: sperm and ovum in Sea-urchin and mammals	SB	2	Theoretical
Egg Membranes	SB	2	Theoretical
Fertilization: In Sea-urchin and mammals	SB	4	Theoretical
Cleavage: Cleavage plane, types, role of yolk in cleavage; cleavage process in sea-urchin and mammals	SB	4	Theoretical
Blastula formation: sea urchin and chick	SB	4	Theoretical
Fate map: fate mapping methods. Fate map in chick blastula.	SB	2	Theoretical
Morphogenetic movements: Types and examples.	SB	2	Theoretical
Gastrulation: Frog & chick	SB	6	Theoretical
Organizer: Speman-Mangold organiser experiment; concept of induction, determination, and differentiation	SB	2	Theoretical
Placenta: Types, examples and functions	SB	4	Theoretical
Extra-embryonic membrane: Formation and function in chick	SB	2	Theoretical
Concepts of cryopreservation of gametes and embryo of man, IVF and embryo transfer in man	SK	4	Theoretical
Stem cell: ES and adult stem cell, characteristic features, definition of potency and niche, markers in human stem cell, potential application of stem cells as regenerative medicine	SK	4	Theoretical
Organogenesis – development of eye as an example of reciprocal and repeated inductive events	SK	4	Theoretical
<b>Total Marks -50</b>			

**PAPER 2, UNIT 2**  
**{PRACTICAL}**

<b>PRACTICAL</b>	<b>Teacher</b>	<b>Class Hour</b>	<b>Teaching Method</b>
<b>Animal forms &amp; comparative anatomy (10)</b>			
Study of internal organ systems of one non-chordate (Periplaneta) and one chordate (Oreochromis) – [Periplaneta: Nervous system, Digestive system, Reproductive system. Oreochromis: Digestive system, Urinogenital system, Olfactory apparatus.]	SB	10	Practical
Anatomical study: kidney, brain, heart, limb bones of different vertebrates using picture/photo or models (clay/plastic/plasticin) or computer generated models	SK	4	Practical
<b>Cytological methods &amp; Genetics (15)</b>			
Demonstration and description of compound microscope. Measurement of size (length/breadth) by micrometry of any Cell/organ/protozoa	SK	4	Practical
Pedigree analysis (autosomal, X linked and Y linked traits only).	SB	4	Practical
Study of meiotic stages from Grasshopper	SB	6	Practical
<b>Osteology &amp; Embryology (15)</b>			
Identification of bones with reasons: (a) Skull of Calotes, a poisonous snake, Chelonia, Columba, Cavia (b) Vertebrae of Columba & Cavia (c) Appendicular bones of Columba & Cavia (d) Girdle bones of Columba & Cavia	SB	10	Practical
Identification of whole mount embryo (24 hrs, 48 hrs, 72 hrs and 96 hrs) of chick	SB	4	Practical
Identification of larval forms: Nauplius, Ephyra, Zoea, Mysis, Megalopa, Glochidium, Trochophore, Veliger, Bipinnaria, tadpole.	SB	4	Practical
<b>Laboratory note Book (5)</b>			
<b>Viva Voce (5)</b>			
<b>Total Marks -50</b>			

**PAPER 3, UNIT I**

<b>Systematics, Evolutionary Biology &amp; Animal Behaviour</b>	<b>Teacher</b>	<b>Class Hour</b>	<b>Teaching Method</b>
<b>Group A: Systematics</b>			
<b>Taxonomy</b> – Levels of taxonomy ( alpha, beta and gamma taxonomy, micro and macro taxonomy), scope of taxonomy	SB	2	Theoretical
<b>Systematics</b> – Place of Systematics in Biology, contribution of Systematics in Biology	SB	2	Theoretical
<b>Classification</b> (Phenetic and Cladistics)	SB	2	Theoretical
Concept of dendogram and cladogram	SB	2	Theoretical
Biological Species concept, Subspecies, Polytypic species, Sibling species and Ring species	SB	2	Theoretical
Isolation and its role in speciation (pre mating and post mating)	SB	2	Theoretical
<b>Modes of speciation</b> – Sympatric, Allopatric and Parapatric	SK	4	Theoretical
<b>Type concept</b> – names of primary and secondary types, their definitions and applications	SB	2	Theoretical
Basic principle and use of DNA bar coding in species identification	SB	2	Theoretical
<b>Group B: EVOLUTION AND ADAPTATION</b>			
RNA world & Origin of life (Chemical origin only)	SK	2	Theoretical
Natural selection, Synthetic theory. Concept of selection: stabilizing, directional and disruptive with example	SK	2	Theoretical
Hardy-Weinberg equilibrium; calculating allele & genotype frequency, mathematical calculation of frequency changes in mutation, migration	SK	4	Theoretical
Genetic drift, founder effect and population bottleneck	SK	2	Theoretical
Bathymetric and discontinuous distribution	SK	2	Theoretical
Barriers and dispersals - types and their impact on animal distribution	SB	2	Theoretical
Zoogeographical realms – names & animal distribution according to Wallace scheme, Avian and Mammalian faunal distribution in different realms	SB	4	Theoretical
Origin of birds	SK	2	Theoretical
Evolution in horse	SK	2	Theoretical
Xeric (camel and lizard); Arboreal (sloth bear) adaptation	SK	2	Theoretical
Adaptive radiation with special reference to Darwin's finches	SK	2	Theoretical

<b>Group – C: ANIMAL BEHAVIOUR</b>			
Instinctive and learning behavior, fixed action pattern	SK	2	Theoretical
Communication in honey bees (dance language and pheromone)	SK	4	Theoretical
Altruism, kinship and selfishness	SK	2	Theoretical
Echolocation in bat	SK	2	Theoretical
Parental investment (fish only); cost and benefit analysis of parental investment; parent-offspring conflict	SB	4	Theoretical
Bird migration	SB	4	Theoretical
<b>Total Marks -50</b>			

### PAPER 3, UNIT II

<b>Ecology, Biodiversity and Conservation</b>	<b>Teacher</b>	<b>Class Hour</b>	<b>Teaching Method</b>
<b>Group A: ECOLOGY</b>			
Concept of Ecosystem – structure and function; generalized model of energy flow in ecosystem	SB	2	Theoretical
Wetland as ecosystem service provider	SB	2	Theoretical
Population attributes – dispersal, dispersion, survivorship curves, age distribution	SB	4	Theoretical
Population growth models – natality, mortality exponential and logistic, density dependent and density independent factors	SB	4	Theoretical
Life history analysis, r and k strategies	SB	2	Theoretical
Population interactions – emergence of competition as a central theory experiments of Tansley, Gause and Park, competition exclusion principle, interspecific and intraspecific competitions, Lotka Volterra model	SB	4	Theoretical
Animal's space and resource use. Resource partitioning. Coupled oscillations of predator and prey population – modeling	SB	4	Theoretical
Community and ecosystem – assemblage, guild and community concept, niche concept, edge effect	SB	4	Theoretical
Ecological succession, types of ecological succession with examples, concept of Climax, Connell and Slatyer' model of succession. Tilman's resource-ratio hypothesis	SB	4	Theoretical
Brief idea on El nino, La nina and their consequences	SB	2	Theoretical

<b>Group B: BIODIVERSITY AND CONSERVATION</b>			
Types of biodiversity, biodiversity and human welfare, mega diversity zones and biodiversity hot spots with special reference to India	SK	4	Theoretical
Concept of wildlife, wildlife heritage of India, reasons for wildlife depletion in Indian context	SK	4	Theoretical
Concept of threatened fauna – IUCN categories.	SK	2	Theoretical
Protected area concept – Sanctuary, National Park, Biosphere reserve, Core Zone, Buffer Zone, Corridor concept. Conservation reserves	SK	4	Theoretical
JFM & Arabari model for conservation – key stone, flagship and umbrella species	SK	2	Theoretical
Special management program with special reference to Tiger project	SK	2	Theoretical
Man–animal conflict (man-tiger and man-elephant) – causes and concern	SK	2	Theoretical
Environmental audit and impact assessment	SK	2	Theoretical
Role of NGO's in wildlife conservation in India	SK	2	Theoretical
<b>Total Marks -50</b>			

**PAPER 4, UNIT I**  
**Animal physiology and Biochemistry**

<b>Animal physiology and Biochemistry</b>	<b>Teacher</b>	<b>Class Hour</b>	<b>Teaching Method</b>
<b>Group A: ANIMAL PHYSIOLOGY</b>			
Structure & function of haemoglobin, transport of O <sub>2</sub> and CO <sub>2</sub> in mammals, Bohr and Haldane effect, Chloride shift	SB	4	Theoretical
Physiology of excretion – physiology of urine formation, urea cycle, nitrogenous wastes ammonia, urea, uric acid, creatinine.	SK	4	Theoretical
Physiology of osmo-regulation in vertebrates	SK	2	Theoretical
Origin and propagation of nerve impulse through nerves, synaptic and neuro-muscular junctions, functional significance of Giant nerve fibers in mollusks	SKSK	4	Theoretical
Physiology of skeletal muscle contraction	SK	2	Theoretical
Temperature regulation in cold desert	SK	2	Theoretical
Physiology of vision in human, compound eyes and image formation in insects	SK	4	Theoretical

Physiology of hibernation and aestivation with reference to amphibians, reptilians and gastropods	SK	2	Theoretical
<b>Group B: BIOCHEMISTRY</b>			
Carbohydrate metabolism – Glycogenesis, Glycogenolysis, Neoglucogenesis	SB	4	Theoretical
Metabolism of amino acids; transamination and oxidative and non-oxidative deamination	SB	4	Theoretical
Nucleic acid metabolism – Purine salvage pathway	SB	4	Theoretical
Beta-oxidation of fatty acids:- Palmitic acid {saturated (C 16:0)}, Linoleic acid {unsaturated (C 18:2)}	SB	4	Theoretical
Integration: Krebs cycle, Oxidative phosphorylation and Electron transport chain	SB	4	Theoretical
Enzymes - Classes; kinetics and factors affecting enzyme action, enzyme inhibition	SB	4	Theoretical
Structure and function of neuro-transmitter: glutamate, $\gamma$ -aminobutyric acid (GABA), dopamine (DA), norepinephrine (noradrenaline; NE, NA), epinephrine (adrenaline)	SB	4	Theoretical
<b>Total Marks -50</b>			

**PAPER 4, UNIT II**  
**(PRACTICAL)**

<b>PRACTICAL</b>	<b>Teacher</b>	<b>Class Hour</b>	<b>Teaching Method</b>
<b>Ecological methods: (10)</b>			
Use of pH meter for estimation of pH in water and soil samples	SB	4	Practical
Study of micro arthropods of water and soil samples	SB	4	Practical
Determination of dissolved O <sub>2</sub> , free CO <sub>2</sub> of water	SB	4	Practical
Zoo-plankton count by standard methods	SB	4	Practical
<b>Systematic &amp; Evolutionary Biology: (10+10)</b>			
General discussion, distinguishing characters and classification of respective Phylum should be taken into consideration. In Laboratory Note Book scheme of classification of all Phylum should be written before identification	SB	10	Practical
Key making with the specimens both from non-chordate (e.g., insects) and chordates (e.g., fishes)	SB	4	Practical

Identification with reasons of the following Museum specimens should be done:- Non-chordates, Chordates	SB	10	Practical
<b>Animal Physiology and Biochemistry (10)</b>			
Quantitative estimation of protein by modified Lowry's colorimetric method	SB	4	Practical
Qualitative tests for Carbohydrate (Starch, Sucrose, Maltose Fructose, Glucose), Protein (Albumin, Gelatin, Peptone), fat, uric acid (in Alkaline solution) and urea (Tests to be performed – Red Litmus Test, Hypobromite test, Biuret test, Millon's test, Iodine test, Benedict's test, Barfoed test, Seliwanof's test)	SB	10	Practical
Counting of cockroach haemocytes using haemocytometer	SB	4	Practical
Preparation of Normal, molar and standard solutions, phosphate buffers, serial dilutions	SK	4	Practical
<b>Submission of Laboratory note Book (5)</b>			
<b>Viva Voce (5)</b>			
<b>Total Marks -50</b>			

**PART III  
(PAPER 5, UNIT I – THEORY)**

<b>Molecular Biology</b>	<b>Teacher</b>	<b>Class Hour</b>	<b>Teaching Method</b>
<b>Genome analysis:-</b> <ol style="list-style-type: none"> <li>a. DNA sequencing: Principle of Dideoxy sequencing</li> <li>b. Restriction enzyme: Types and use in gene cloning</li> <li>c. Cloning vectors: Characteristic features, Plasmid vector (pBR322, pUC19), Cosmid, phage vector, Concept of expression and Shuttle vector</li> <li>d. Construction of genomic DNA and cDNA libraries</li> <li>e. PCR: Basic Principle. Use of Allele specific RT-PCR</li> <li>f. DNA fingerprinting: Principle of RFLP, mini-satellites, microsatellites, RAPD and its uses</li> <li>g. Blot Technique: Southern Blot and Northern Blot</li> </ol>	SB	10	Theoretical
Proteome Analysis: Principle and use of SDS PAGE, affinity chromatography and Gel Filtration chromatography, immunoelectrophoresis, Western blot (excluding methodology)	SB	6	Theoretical
Regulation of gene expression: Operon concept (inducible and repressible viz. Lac and Tryptophan operon)	SK	6	Theoretical
Epigenetic regulation of gene expression: DNA methylation (CpG) and histone acetylation	SB	4	Theoretical
Recombination: Homologous recombination, Holliday Model of recombination, definition and example of site	SB	4	Theoretical

specific and transpositional recombination; Gene conversion			
DNA repair mechanism: Base and nucleotide excision repair in bacteria, Mismatch repair, SOS repair	SK	4	Theoretical
Apoptosis: concept, molecular signaling (extrinsic and intrinsic) and significance	SK	4	Theoretical
Cell cycle & cancer genetics: Concept of cell cycle check points and molecular regulation, concept of normal and transformed cell, role of proto-oncogene, tumour suppressor genes. Molecular mechanism of proto-oncogene activation	SK	6	Theoretical
Molecular basis and detection technique for human genetic disorders: Sickle cell Anemia, Thalassemia, Hemophilia	SB	6	Theoretical
Transposable Genetic Element: Concept of transposon and retrotransposon, Characteristic features of IS element in bacteria SINE and LINE element in mammals and their role in chromosomal aberration	SB	4	Theoretical
<b>Total Marks -50</b>			

## PAPER 5, UNIT II

Parasitology, Microbiology and Immunology	Teacher	Class Hour	Teaching Method
<b>Group A: PARASITOLOGY and MICROBIOLOGY</b>			
Inter-specific associations	SB	2	Theoretical
Origin and evolution of parasitism with special reference to nematodes	SB	2	Theoretical
Host-parasite interaction, parasitic adaptations in internal parasites with special reference to protozoa and helminths	SB	2	Theoretical
Life cycle of important parasites; Mechanism of host-finding; establishment in host; growth; reproduction and modes of transmission of a) Plasmodium vivax, b) Entamoeba histolytica, c) Leishmania donovani, d) Wuchereria bancrofti, e) Fasciola hepatica, and f) Ascaris lumbricoides	SB	6	Theoretical
Concept of Vector with special reference to resurgence of malaria (bio-ecology, vector potentiality, present susceptibility status to commonly used insecticide of important rural malaria vectors of India - Anopheles culicifacies)	SB	6	Theoretical
Characterization and classification of bacteria (on the basis of staining methods)	SB	4	Theoretical
Techniques of microorganism culture (sterilization reproduction and growth, maintenance and preservation of pure cultures), Control of micro-organisms	SB	6	Theoretical
Microbes in relation to common diseases of man and control (Cholera and Shigella)	SB	4	Theoretical

Group B: IMMUNOLOGY			
Cells and organs associated with immune system; Innate and adaptive immunity	SB	6	Theoretical
Antigens – characteristics, antigenic determinants, antigen processing and presentation	SB	6	Theoretical
Antibody – structure, types, binding sites and binding mechanisms	SB	6	Theoretical
Cytokines, adjuvants – complete and incomplete	SB	6	Theoretical
Complement proteins – pathways and activation (classical, alternative and lectin mediated pathway, MAC formation)	SB	6	Theoretical
Humoral and cell mediated immunity in man, mollusks and insects	SB	6	Theoretical
T-cell – structure, receptor and maturation (signal hypothesis excluded); B-cell – activation and differentiation (signal hypothesis excluded); Macrophage – types, generation and function	SB	6	Theoretical
MHC: Structure and Function.	SB	6	Theoretical
Monoclonal antibody production strategy and use of monoclonal antibody	SB	6	Theoretical
<b>Total Marks -50</b>			

### PAPER 6, UNIT I

INTEGRATION BIOLOGY & HOMEOSTASIS	Teacher	Class Hour	Teaching Method
<b>Neuro-endocrine integration</b>			
General concept of hormone action and receptors	SK	2	Theoretical
Chemical messengers – kiromones, synomones, info-chemicals, semio-chemicals – their types, mode of action and behavior modulation	SK	2	Theoretical
Homeostasis of Ca <sup>++</sup> regulation and Blood glucose regulation	SK	4	Theoretical
Mechanism of hormone action (cAMP, ip3, DAG, TRK), neuro-hypophysis, adenohypophysis, hypothalamic regulatory peptides, endocrine tissues of the gastrointestinal endoderm	SK	6	Theoretical
Biosynthesis, secretion, mode of action, functional significance and regulation of T3, T4, Adrenalin, Nor-adrenalin, Insulin and Glucagon	SK	6	Theoretical
Insect hormones – neuro-endocrine regulation of diapauses and metamorphosis	SK	4	Theoretical
Environmental signaling in sex reversals in fish and mollusks – role of endocrine disruption and signals	SK	4	Theoretical

Endocrine regulation of estrous and menstrual cycle	SK	2	Theoretical
<b>Biological light production in animals</b>			
Chemistry of bioluminescence in insect and its significance	SK	2	Theoretical
Electric organs in electric rays	SK	2	Theoretical
<b>Biological rhythm</b>			
concept, types and its control by pineal and SCN	SK	2	Theoretical
<b>Total Marks -50</b>			

**PAPER 6, UNIT II**

<b>ANIMAL BIOTECHNOLOGY &amp; APPLIED ZOOLOGY</b>	<b>Teacher</b>	<b>Class Hour</b>	<b>Teaching Method</b>
<b>Transgenic animals</b>			
Production of transgenic animals: cloning (methodology and application)	SB	4	Theoretical
Contribution of transgenic animals to human welfare (Poultry and Dairy)	SB	4	Theoretical
<b>Biotechnology and Applied Zoology</b>			
Modern techniques of fish hybridization and induced breeding in carps.	SB	4	Theoretical
Application of biotechnology in – (a) Sericulture, (b) Lac culture, (c) Api culture, (d) Pearl culture practice, (e) Prawn culture	SB	6	Theoretical
Integrated pest management and biological control of pests: principles and significance.	SB	4	Theoretical
Principle of LD50 and LC50 and their application in applied Zoology	SB	4	Theoretical
<b>Animal cell culture</b>			
Cell culture types	SB	2	Theoretical
Cell culture technology (suspended and adherent culture)	SB	2	Theoretical
Cell culture media (RPMI-1640, M-199 and its components)		2	Theoretical
<b>Gene therapy</b>			
Principle: Ex-vivo & In-vivo gene therapy. Strategies, Viral and non-viral vectors, antisense therapy.	SB	4	Theoretical
<b>Total Marks -50</b>			

**PAPER 7**  
**(PRACTICAL)**

<b>PRACTICAL</b>	<b>Teacher</b>	<b>Class Hour</b>	<b>Teaching Method</b>
<b>Molecular Biology: (15)</b>			
Paper Chromatography for amino acid separation	SK	4	Practical
Slide TLC for oil separation	SB	4	Practical
Quantitative estimation of DNA in solution by Diphenyl method (at 595 nm).	SB	4	Practical
<b>Parasitology &amp; Microbiology: (20)</b>			
Study of gut contents of cockroach (fixation, staining & identification)	SK	4	Practical
Identification, systematic position, characters & clinical importance of the following parasites – Entamoeba, Giardia, Trypanosoma, Plasmodium spp., Leishmania, Wuchereria bancrofti, Ascaris (male & female)	SB	6	Practical
Gram staining of bacteria	SK	4	Practical
<b>Immunology: (5)</b>			
Determination of human blood group	SK	4	Practical
Histology of primary and secondary lymphoid organs – thymus and spleen only	SB	4	Practical
<b>Histological techniques and staining methods:(15+10)</b>			
Tissue fixation, embedding, microtomy, staining and mounting of histological tissues (liver, pancreas, thyroid, kidney, ovary and testis) of white rat	SB	4	Practical
Identification of mammalian histological tissue sections: liver, pancreas, thyroid, kidney, adrenal, ovary, testis, stomach and lung	SB	4	Practical
Identification of stages of estrous cycle in white rat	SK	4	Practical
<b>Adaptations: (15)</b>			
Study of animals from museum specimens to analyze adaptive features for cursorial, aquatic, desert, volant and deep sea adaptations; features for parasitic mode of life.	SK	4	Practical
<b>Submission of Laboratory note Book (10)</b>			
<b>Viva Voce (10)</b>			
<b>Total Marks -100</b>			

**PAPER 8**  
**(PRACTICAL)**

<b>PRACTICAL</b>	<b>Teacher</b>	<b>Class Hour</b>	<b>Teaching Method</b>
<b>Instrumentation (20)</b>			
Principle/function and laboratory use of micropipette, pH meter, colorimeter, centrifuge, digital balance, autoclave	SK	6	Practical
<b>Report on Environmental audit (20)</b>			
Local Biodiversity Record (in group/individual of a particular area) – at least two records of faunal diversity along with ecological notes and photographic documentations in two seasons should be done. For example: butterfly community or bird community of a particular area.	SB	6	Practical
<b>Field work assessment (20):-Submission of field study report on any two of the following</b>			
Ecosystem and its biodiversity assessment. (Any suitable ecosystem) (various diversity indices with explanation must be presented)	SB	6	Practical
Estuarine bheri/freshwater fish farm (species cultured/reared, whether exotic/ornamental fishes are cultured, viability of the farm, cost benefit accounts, impact on local people and prospect in the specific area)			Practical
Poultry farm (species/breed cultured/reared, homeland of the breed, viability of the farm, cost benefit accounts, impact on local people and prospect in the specific area)			Practical
Apiary (species cultured, types of bees cultured, fixed/mobile, viability of the farm, cost benefit accounts, impact on local people and prospect in the specific area)			Practical
Sericulture center (species cultured/reared, description of moth and its host plant cultured, viability of the farm, cost benefit accounts, impact on local people and prospect in the specific area)			Practical
Visit a place of wild life interest (Sanctuary, National Park, Biosphere Reserve etc.) {Man-wildlife conflict, eco-tone, edge effect, eco-sensitivity, economics of the native inhabitants, logging and lopping effect, conservation process practiced etc.}			Practical
Agriculture farms for pest study & idea of IPM practices (type of farm, season visited, status of the farm at the time of visit, observed practices, reported practice, viability of the farm, cost benefit accounts, impact on farmers and impact on the specific beneficiaries)			Practical
Visit to an institution of zoological importance – its documentation. For example: Zoo Garden, ZSI, Zoological Gallery of the Indian Museum, etc.	SB	6	Practical

<b>Biostatistics (20)</b>			
Experimental project work and Data Analysis – Mean, Mode, Median, Probability, Hypothesis testing (Chi-square, t-test. Correlation test, Work shop for advanced biological methods (to be organized once in two years during Part II and Part III)	SB	10	Practical
<b>Submission of Laboratory note Book (10)</b>			
<b>Viva Voce (10)</b>			
<b>Total Marks -100</b>			

**TEACHING PLAN (Zoology General)  
Part –I ,Paper I**

Theory	Teacher	Class Hour	Teaching Method
<b>Group-A: (Course No ZG-01) Functional Anatomy of Non-Chordates (Full marks –35)</b>			
Classification with distinctive features and suitable examples of sub-kingdom Protozoa (up to Phylum) ( Levine et al, 1980) and Phylum Porifera, Cnidaria, Platyhelminthis, Annelida, Arthropoda, Mollusca and Echinodermata (up to Class)	SB	4	Theoretical
General structure & function of the following with reference to the specimens mentioned:- a. Locomotion – Microfibrils (Amoeba), Cilia (Paramecium) b. Feeding & digestion – Microphagy (Amoeba), Macrophagy (Paramecium) c. Respiration – Ctenidium & pulmonary sac (Pila), gills (prawn), Trachea (cockroach) d. Excretion – Nephridia (Earthworm) e. Circulation – Open circulation (Cockroach), Closed circulation (Earth worm) f. Nervous system – Cockroach, Apple snail g. Reproduction : (a) Fission (Amoeba); (b) Budding (Hydra) (c) Conjugation (Paramecium), (d) Metagenesis in Obelia	SB	6	Theoretical
<b>Group – B: (Course No ZG-02) Cell Biology, Genetics and Molecular Biology (Full marks –35) (Lectures: 35)</b>			
Fluid mosaic model of plasma membrane	SK	2	Theoretical
Cell cycle check points	SK	2	Theoretical
Physio chemical properties, types, structures and functions of DNA and RNA.	SK	2	Theoretical
DNA as a genetic material explanation with experiment	SB	2	Theoretical

Mechanisms of replication, transcription and translation in <i>E. coli</i>	SB	2	Theoretical
Linkage and recombination	SB	2	Theoretical
Modes of inheritance of autosomal and sex linked genes in man (Thalassemia & Haemophilia, colour blindness)	SB	2	Theoretical
Sex determination in <i>Drosophila</i> (Genic Balance Theory only)	SB	2	Theoretical
<b>Group – C (Course No. ZG-03) Developmental Biology (Full Marks –30) (Lecture: 30)</b>			
Spermatogenesis and Oogenesis	SK	2	Theoretical
Fertilization in sea urchin	SK	2	Theoretical
Types of eggs and cleavages; process of cleavage in <i>Amphioxus</i>	SB	2	Theoretical
Gastrulation in <i>Amphioxus</i>	SB	4	Theoretical
Extra-embryonic membranes in chick	SB	2	Theoretical
Placenta types and function	SB	2	Theoretical
<b>Total Marks -100</b>			

**PART –II  
Paper II**

Theory	Teacher	Class Hour	Teaching Method
<b>Group A: (Course No.ZG-04) Functional Anatomy of Chordates (Full marks –35) (Lectures: 35)</b>			
Classification of Phylum Chordata with distinctive features and suitable examples – up to living subclass (Amphibia, Reptilia and Mammalia); up to subclass (Fishes and Aves) (Scheme of classification as per J.Z. Young 1980, Life of vertebrates)	SB	4	Theoretical
Functional anatomy – digestive system in <i>Oreochromis</i> ; Circulatory system in <i>Columba</i>	SK	4	Theoretical
Structure & function of the followings:- a. Integument – general structure & function; integumentary derivatives (scales in fishes, feathers of <i>Columba</i> ) b. Pharynx ( <i>Branchiostoma</i> ); stomach ( <i>Bos</i> ) c. Respiratory structures and Respiration : Gill (Fish); lung and Air sac ( <i>Columba</i> ) d. Circulatory structure and circulation: Single circuit heart (fish); double circuit heart (Amphibia and Mammals) e. Nervous system – Brain in <i>Oreochromis</i> f. Origin and distribution of cranial nerves in fish.	SK	6	Theoretical

<b>Group B. (Course No ZG-05) Ecology, Animal Behavior, Biodiversity and Wildlife</b>			
<b>(Full marks –35)</b>		<b>(Lectures: 35)</b>	
Population – definition and growth	SB	4	Theoretical
Community – definition and types	SB	4	Theoretical
Basic concept of Biodiversity, Biodiversity hotspots	SB	2	Theoretical
Honey bee – Hive, castes and their roles	SK	2	Theoretical
Conservation of wild life – purpose & methods, concept of Biosphere Reserve, importance & strategies of wildlife conservation; National park & Wildlife Sanctuary.	SB	4	Theoretical
Basic idea of ecotoxicology and xenobiotics	SK	2	Theoretical
Climate change – Global warming, acid rain, ozone depletion (cause and effect)	SK	2	Theoretical
<b>Gr. C (Course No ZG-06) Histology, Endocrinology, Animal Physiology &amp; Biochemistry</b>			
<b>(Full Marks –30)</b>		<b>(Lecture: 30)</b>	
General characters of hormones: Naming and function of hormones secreted from Pituitary	SB	4	Theoretical
Histology of pancreas (theory)	SB	4	Theoretical
Enzyme – classification & characteristics; mechanism of enzyme action; effects of pH and temperature on enzymatic action	SB	4	Theoretical
Nerve impulse propagation & synaptic transmission	SB	4	Theoretical
Osmoconformers and Osmoregulators – definition and example; Osmoregulation in fishes	SK	4	Theoretical
<b>Total Marks -100</b>			

**Paper III.**  
**(PRACTICAL)**

<b>PRACTICAL</b>	<b>Teacher</b>	<b>Class Hour</b>	<b>Teaching Method</b>
<b>Demonstration</b>		<b>Marks-(15+15=30)</b>	
Cockroach: digestive, nervous and female reproductive system	SB	10	Practical
Oreochromis: digestive and urino-genital system	SK	10	Practical
<b>Mounting and preparation</b>		<b>Marks-(7½+7½=15)</b>	
Mouth parts of cockroach	SB	4	Practical
Cycloid and Ctenoid scale of fin fish	SB	4	Practical

Haemolymph of cockroach (Leishman/Giemsa stain)	SB	4	Practical
Gut contents of cockroach for protozoa (Fixation, staining and identification)	SK	4	Practical
Whole mount of aquatic and soil micro-arthropods	SB	4	Practical
Epithelial cells from buccal smears with staining	SK	4	Practical
<b>Identification with reasons: 1 from bones, 1 from histological slides, 2 from non-chordates and 2 from chordate specimens; systematic position up to taxon as mentioned in the theory</b>			
<b>Marks-30</b>			
Bones: Skull, vertebrae, limb and girdle bones of Columba	SB	10	Practical
Histological slides: Sections of mammalian liver, pancreas, testis, ovary, and thyroid	SK	4	Practical
Non-chordate specimens: Paramoecium, Scypha, Sea-anemone, Ascaris (male & female), Hirudinaria, Scorpion, Bombyx mori (adult male & female), Lamellidens, Pila, Loligo, Starfish, Balanoglossus.	SB	10	Practical
Chordate specimens: Amphioxus, Petromyzon, Scolidon, Lates, Rhacophorus, Axolotl larva, Tylostotriton, Gekko; Hemidactylus, Turtle, Naja, Chiroptera	SB	10	Practical
<b>Report on field study tours: Marks 10</b>			
Zoological importance: Zoological garden or Museum	SB	6	Practical
<b>Submission of Laboratory note Book (5)</b>			
<b>Viva Voce (10)</b>			
<b>Total Marks -100</b>			

**Part-III  
Paper IV**

Theory	Teacher	Class Hour	Teaching Method
<b>Group A. (Course No ZG-8): Applied Zoology (Full marks –30)</b>			
<b>(Lectures: 30)</b>			
Sericulture: Life history and rearing of Bombyx mori, harvesting & processing of cocoon, reeling and extraction of silk, diseases of worms of Bombyx mori and control measures.	SB	4	Theoretical
Aquaculture: Principles, definition and scope. Exotic fishes- their merits and demerits. Basic principles of different aquaculture system (Polyculture and integrated farming); culture of prawn	SB	4	Theoretical
Pest and Management: a) Definition and types of pests with examples. Life history, behaviour, ecology,	SB	4	Theoretical

damage and control of the following pests: i) Paddy Scirpophaga (Syn. Tryporyza) incertulas, ii) Stores grain-Sitophilus oryzae, iii) Mammalian pest (Bandicota bengalensis).			
Apiculture: Development of Apiary in India. Types of honey bees, modern methods of apiary management, products and its uses. Problems and prospects	SB	4	Theoretical
Poultry: fowl - Types of breeds, rearing and disease management	SB	4	Theoretical
<b>Gr. B. (Course No ZG-09) Parasitology &amp; Immunology (Full marks –20) (Lectures: 20)</b>			
Parasitism (definition and types) and other inter-specific interactions (symbiosis, commensalism and mutualism).	SB	4	Theoretical
Life history, Pathogenecity and clinical features of (i) Entamoeba histolytica, (ii) Plasmodium vivax, (iii) Ascaris	SB	4	Theoretical
Outline structure and classification of immunoglobulin, antigen-antibody reaction	SB	4	Theoretical
<b>Group – C. Evolutionary Biology Course No ZG-10 (Full Marks –20) (Lecture: 20)</b>			
Definition of systematics & taxonomy	SB	2	Theoretical
Species as a unit of evolution (definition and types: biological, sibling and polytypic species)	SB	4	Theoretical
Chemical basis of origin of life	SB	4	Theoretical
Anatomical and Physiological adaptations: Aquatic (fish), Desert (Camel) and Volant (Pigeon) animals.	SB	4	Theoretical
Zoogeographical realms (Wallace scheme) with characteristic mammalian fauna	SB	4	Theoretical
<b>Group – D. Laboratory course (Course No.ZG-11) (Full Marks –30) (Lecture: 30)</b>			
<b>Experimental works:-</b> a. Estimation of dissolved O <sub>2</sub> content of water or Estimation of free CO <sub>2</sub> content of water b. Pedigree analysis: sex linked recessive, autosomal recessive and dominant c. Determinant of ABO blood group & Rh factor in man or Measurement of water pH and handling of pH meter	SB	10	
<b>Field training – Submission of report on any one place from the following:-</b> a. Freshwater fish farm b. Poultry farm c. Apiary d. Sericulture center e. Place of wild life interest (Sanctuary, National Park) f. Species diversity studies in local area.	SB	10	

Identification: (Write specimen characters and applied importance) any three:- Taenia solium, Scirpophaga (Syn. Tryporyza) incertulas, Sitophilus oryzae, Epilachna, Lepisma, Termite queen, Bandicota bengalensis, Labeo rohita, Catla catla, Cyprinus carpio, Tenualosa (Hilsa) ilisha, Penaeus sp, Macrobrachium rosenbergi			
<b>Total Marks -100</b>			

NAME OF TEACHERS

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