

Syllabus and Course Scheme

Academic year 2018-19



Master of Science- Zoology

III and IV Semester Examination, 2018-19

UNIVERSITY OF KOTA

**MBS Marg, Swami Vivekananda Nagar,
Kota - 324 005, Rajasthan, India**

Website: *uok.ac.in*

II YEAR: III SEMESTER

Paper-Z-11 CHORDATA

Paper-Z-12 ANIMAL ECOLOGY

Paper-Z-13 RESEARCH METHODOLOGY

Paper-Z-14 SPECIAL PAPER

Paper-Z-15 ZOOLOGY Practical: Duration 10 Hrs; MM 100, Min 50.

Day 1; 5 Hrs (Z-11 & Z-12 & Z-13)

Day 2; 5 Hrs (Z-14).

Paper-Z-11 CHORDATA

UNIT – I

1. Origin and outline classification of chordates.
2. Interrelationships of Hemichordata, Urochordata and Cephalochordata and their relations with other deuterostomes.
3. Life histories of sessile and pelagic tunicates (ascidian), *Pyrosoma*, *Salpa*, *Doliolum* and *Oikopleura*.

UNIT - II

1. Geological time scale and fossils.
2. Origin, evolution and adaptive radiations of vertebrates: Agnatha. (Ostracoderms and Cyclostomes).
3. Early gnathostomes (Placoderms).

UNIT - III

1. A general account of Elasmobranchi, Holocephali, Dipnoi and Teleostomi.
2. Adaptive radiation in bony fishes.
3. Origin, evolution and adaptive radiation of Amphibia.

UNIT - IV

1. Origin and evolution of reptiles; the conquest of land Seymouria and related forms; Cotylosauria; basic skull types and outline classification of reptiles.
2. Dinosaurs : Types and evolutionary significance.
3. Living reptiles : a brief account of Rhynchocephalia, Chelonia, Squamata & Crocodilia.

UNIT - V

1. Origin and evolution of birds; Origin of flight; flight adaptations.
2. Origin of mammals, primitive mammals (Prototheria & Metatheria). A general survey of main radiations in eutherian mammals, excluding detailed reference to individual orders.
3. Evolution of man; relationships of man with other primates; fossil record of ancestry of man.

PAPER Z -12: ANIMAL ECOLOGY

UNIT - I

1. Concepts of modern ecology.
2. Limiting factors : Leibig's law of minimum, Shelford's law of tolerance; combined concept of limiting factors, conditions of existence as regulatory factors.
3. Analysis of environment: The general Methods.

UNIT – II

1. Role of physical factors: temperature, light, water, atmospheric gases, media, substratum, climatology.
2. Brief review of important physical factors as limiting factor.
3. Nutrients and environment.

UNIT – III

1. Organization at the population level : (a) General properties of population. (b) Population growth form and forces shaping the population growth. (c) Measurement of population; simple numerical problems on population measurement. (d) Animal aggregation and social life.
2. Organization at the community level : (a) Biotic community concept. (b) Community structure and concept of community dominance. (c) Ecotone and concept of "edge effect".
3. Patterns in communities : Stratification, zonation, activity, food web, reproductive and social structure. (e) Community versus continuum. (f) Evolution of communities.

UNIT – IV

1. Succession in community : Basic types of succession; convergence and divergence in succession; modifications in succession; concept of climax, monocl意思 versus polyclimax theory; barriers and ecesis in succession; biome.
2. Fluctuations within community : Irruptive cycle, fluctuation, causes of fluctuation, cycles.
3. Environment and animals in ecosystem : (a) Nature and constituents of ecosystem. (b) Fundamental operation of ecosystem. (c) Flow of matter and energy in ecosystem. (d) Homeostasis in the ecosystem. (e) Cycling of chemical elements in ecosystem (bio-geo-chemical cycles).

UNIT – V

1. Concept of productivity: Productivity of land and water, measurement of productivity.
2. Organization and dynamics of ecological communities : The habitat approach : A detailed knowledge of extent, zonation, environment, biota, adaptations and communities of fresh water, marine, terrestrial and estuarine ecosystems.
3. The ecological outlook: Space ecology, nuclear radiations, human population explosion, resources; applied human ecology.

PAPER Z – 13 RESEARCH METHODOLOGY

UNIT-I

Research Methodology – Presentation of data, Types and Characteristics of good tables. Diagrams, Graphs, Various statistical Methods, Limitations of the statistical methods.

UNIT-II

Types of Research: (A) On the basis of nature of information: (i) Qualitative Research: (ii) Quantitative Research: (B) On the basis of utility of content or nature of subject matter of research: (i) Basic/ Fundamental /pure or Theoretical Research: Its utility is universal. (ii) Experimental or Applied Research: Its utility is limited.

UNIT-III

Types of Research: (C) On the basis of approach of research: (i) Longitudinal Research: (ii) Cross-Sectional Research: (D) On the basis of method of research (i) Philosophical Research: (ii) Historical Research: It is both qualitative as well as quantitative in nature and deals with past events. Survey Research: discretionary, correlational and exploratory types of research. (iv) Experimental Research: (v) Case-Study Research.

UNIT-IV

Difference between research Journal and science magazine, qualities of good Journal, National and International Journal in Zoology. Importance of journal in Zoology, Importance of patent in research, Process of getting patent rights.

UNIT-V

Use of Computers in Zoology. Fundamentals of Computers. History of computers. Software Programme for Zoology. Principal and working system of Audiovisual Equipments. Preparation of power point presentations.

Paper-Z-14 (A) SPECIAL PAPER: PAPER- CELL BIOLOGY

Unit - I

1. Concept of Cell Theory
2. Cell Types: Detailed structure of the different types of cells.
(a) Nerve Cell (b) Muscle Cell (c) Gland Cell (d) Blood Cell
3. Cell Membrane:
 - a. Study of various models of the molecular structure of the cell membrane as suggested by Devson & Danielli, Obertson & Green : Other recent views on the subject.
 - b. Molecular structure of the specialized modifications of the cell membrane (Cilia, flagella, myelin, sheath etc.).

- c. Concept of cell surface: Electro kinetic properties of cell surface their role in intercellular, inter-action in cell fusion, Cell aggregation etc.
- d. Properties & functions of the cell membrane, with special reference to permeability.

Unit- II

1. Cytoplasm: (a) Generalized structure & composition of the cytoplasm. (b) Detailed discussion on the following cytoplasmic componets with special reference to the biochemical and physiological aspects. (i) Endoplasmic reticulum (ii) ribosomes (iii) Golgi body (iv) mitochondria (v) Lysosomes, peroxisomes & other related particles (xi) Centrosomes.

Unit- III

1. Nucleus: (a) Structure & functions of the nuclear envelop. (b) Structure and chemical organization of the resting nucleus. (c) Nucleus & Nucleolar extrusions. (d) Chemistry and biosynthesis of nucleic acids. 1. Chromosomes: (a) Structural, chemical and functional organization of the different types of chromosomes (autosomes, giant chromosomes, sex chromosomes supernumerary, chromosomes etc.). (b) Chromosomal aberration. (c) Variation and evolution of chromosome numbers.

Unit- IV

1. Cell Division: (a) Detailed structural, chemical & physiological study of mitotic and meiotic divisions, with special reference to the mechanism of chromosome movement and organization of the spindle apparatus.
(b) Mitotic poisons and their action.
(c) Polyploidy
(d) Polysomy

Unit- V

1. Gametogenesis: (a) Cytologica,l cytochemical and endocrinological study on the developing male & female germ cells. (b) Physiology of ovum and spermatozoon. (c) Physiology of the union of gametes and the acrosome reaction.

Cell Biology Practical Syllabus based on Paper Z-14 (A)

1. Cytological, cytochemical and physiological study on the cells.
2. Study of cell division study of mitotic and meiotic divisions, with special reference to the mechanism of chromosome movement.
3. Chromosomes: study and slide preparation of normal and giant (lamp brush and polytene) chromosomes.
4. Study of various microscopy techniques.
5. Study of various cell organelles.

Scheme of M.Sc. III Semester Zoology: Practical (Cell Biology) Examination
Distribution of Marks

Time : 5 hrs	Max Marks: 50
1. Exercise on techniques	05 marks
2. Permanent preparation (cell organelles/cell division)*	05 marks
3. Exercise on Cytochemical/physiological study	08 marks
4. Spotting (Permanent slides, Models, Photo etc.) 5 spots x 2 marks	10 marks
5. Seminar	05 marks
6. Viva-voce	05 marks
7. Class Record	10 marks
Total	50 marks

PAPER-Z – 14 (B) ENVIRONMENTAL BIOLOGY

UNIT - I

1. System analysis including models in environmental Biology. 2. Impact of environment at cellular level : Cellular interaction with environment.

Unit- II

1. Environmental Physiology: Basic Metabolic rate and body size Metabolism and climatic adaptations - Hibernation and aestivation Poikilotherms and Homeotherms Asphyxic responses. 2. Response to temperature and Pressure. Hematological changes, Thermal properties of water and survival limits, Acclimatization.

Unit-III

1. A detailed study of different ecosystems. (Study including abiotic and biotic components and their interrelationship, productivity and adaptations of animals). 2. Terrestrial Ecosystems: 1. Grasslands (including grazing lands) 2. Forests : characteristics of alpiners, temperate and tropical forests: Stratification, high altitude (with special reference to Himalayanecology) 3. Deserts: Types and ecological attributes of desert biota. 4. Taiga: Extent and ecological peculiarities 5. Tundra: Extent and ecological peculiarities

Unit- IV

1. Aquatic Ecosystems: 1. Fresh Water: Lakes (including salt lakes) Ponds streams, springs, rivers and marshes. 2. Marine: Zonation fauna 3. Esturine : Ecological peculiarities and adaptations (including impact on fauna) 2. A general knowledge of Biogeography.

Unit- V

1 . Development and evolution of ecosystems: causes and kinds of succession diversity and productivity in relation to succession and development. 2. Urban, rural and other Man-made ecosystems, their impact on animal life. Urbanization and industrialization. Socio-ecological impacts.

Environmental Biology Practical Syllabus based on Paper Z-14 (B)

- (1) Measurement of climatic factors (atmosphere, water, temperature and relative humidity).
- (2) Measurement of water and soil pH, edaphic factors of soil; preparation of soil extract, determination of humidity in microhabitat; pH, alkalinity of water, dissolved oxygen, free carbon dioxide, chloride, salinity, temporary and permanent hardness of water, turbidity, velocity of current.
- (3) Measurement of population density. Numerical problems of population determination to be done.
- (4) A field study of any one of the following habitats to be assigned to an individual or to a group of students:
 - (i) Pond habitat.
 - (ii) Marine habitat.
 - (iii) Terrestrial habitat

Scheme of M.Sc. III Semester Zoology: Practical (Environmental Biology) Examination Distribution of Marks

Time : 5 hrs

Max Marks: 50

SN	Exercise	Marks
1.	Exercise on Analysis of water sample	06 marks
2.	Exercise on Analysis of soil sample	04 marks
2.	Permanent preparation	04 marks
3.	Identification of plankton (Phyto- and Zooplankton)	06 marks
4.	Identification and comments on 5 spots	10 marks
5.	Viva-voce	05 marks
6.	Class Record, Field Trip and Project Report	10 marks
7.	Seminar (internal)	05marks
Total		50 marks

PAPER-Z – 14 (C) : ENTOMOLOGY (Morphology, Physiology and Systematics)

UNIT : I

1. Insect integument : Structure, composition and functions. 2. Biochemistry of sclerotisation. 3. Functional morphology : Head, thorax, abdomen and appendages, head segmentation, wing venation. 4. Flight muscles and its functions.

UNIT : II

1. Digestive system : Alimentary canal and physiology of digestion. 2. Circulatory system : Anatomy, physiology; composition of haemolymph. 3. Respiratory system : Structure and physiology. 4. Excretory system : Functional architecture.

UNIT : III

1. Nervous system : Structure and physiology. 2. Neuro endocrine system. 3. Sense organs : Chemoreceptors, mechanoreceptors, photoreceptors, sound and light producing organs, visual organs and physiology of vision. 4. Reproductive system : Structure and physiology.

UNIT : IV

1. Classification of insects up to order and suborders. 2 . Introduction to primitive insects and fossil insects, cause of success of insects.
3. Origin and evolution of insects.

UNIT : V

1. Detailed classification of the following orders emphasizing selected super families and families : Orthoptera, Isoptera, Coleoptera, Homoptera, Hemiptera, Lepidoptera, Diptera and Hymenoptera. 2. Economic importance of these orders. 3. Social life in Isoptera and Hymenoptera. 4. Caste determination in social insects.

Entomology Practical Syllabus based on Paper Z-14 (C)

1. Museum study for identification of insects from various orders (prescribed in theory syllabus).
2. Permanent Preparation: a. Whole mounts of microscopic insects. b. Different types of mouth parts, antennae, legs and wings. c. Sting apparatus and pollen basket of honey bee. d. Tympanum and spiracle of grasshopper.
3. Anatomy a. Cockroach - Digestive, circulatory, reproductive systems and neuroendocrine complex. b. Grasshopper - Digestive, circulatory, reproductive systems and neuroendocrine complex. c. House cricket - Digestive, reproductive and nervous systems. d. Bug - Digestive and nervous systems. e. Butterfly - Digestive and nervous systems. f. Housefly - Digestive and

- nervous systems. g. Honey bee - Digestive and nervous systems. h. Wasp - Nervous systems. i. Beetle - Nervous systems.
4. Study of permanent slides.
 5. A tour to visit important centers of entomological / toxicological studies/Field study.

Scheme of M.Sc. III Semester Zoology: Practical (Entomology) Examination

Distribution of Marks

Time : 5 hrs

Max Marks: 50

1. Learning of insect anatomy by chart	07 marks
2. Permanent preparation.*	05 marks
3. Identification of spots (8x11/2).	12 marks
4. Dissection*	06 marks
5. Record and Report on field trip	10 marks
6. Seminar (internal)	05 marks
7. Viva-voce	05 marks
Total	50 marks

PAPER- Z -14 (D): FISH BIOLOGY

UNIT- I

1. Geographical distribution: Classification of fishes, with distinguishing characters of principal subdivisions. 2. Status and conservation of fish fauna of India with special reference to Rajasthan. 3. General account and phylogenetic significance of Ostracoderms and Placoderms. 4. Origin and adaptive radiation of various groups. 5. Body form and locomotion.

UNIT-II

6. Integument, exoskeleton and colouration of fishes. 7. Structure, modification and functions of median and paired fins. 8. Theories of origin of median and paired fins. 9. Musculature: Lateral musculature, jaw and respiratory musculature, fin musculature and eye muscles.

UNIT-III

10. Endoskeleton: Neurocranium and visceral arches, vertebral column, fin skeleton and girdles, types of jaw suspension in fishes. 11. Food, feeding habits, alimentary canal and physiology of digestion. 12. Blood, heart, vascular system and circulation of blood. Haemoglobin and its

adaptation in fishes. 13. Respiratory organs, physiology of respiration and its regulation. Air breathing organs.

UNIT-IV

14. Excretory organs and physiology of excretion. Osmoregulation in marine, fresh water and estuarine fishes. 15. Structure, function and physiology of swim-bladder. 16. Weberian apparatus and its significance. 17. Nervous system and sense organs, lateral line system.

UNIT-V

18. Endocrine glands and their hormones. 19. Reproduction in fishes: Reproductive organs (male and female), reproductive behaviour, courtship and parental care, general study of fish behaviour, hormonal control of reproduction. 20. Embryogenesis: Ontogenic development in fishes, categories of fishes with respect to development; viviparity; molecular aspect of yolk formation. 21. Recent trends in fish study and research, recombinant DNA technology in fish research.

Fish Biology Practical Syllabus based on Paper Z-14 (D)

1. Complete anatomy of a teleost, represented by *Wallago attu* or any other locally available teleost: External features, general viscera (including urino-genital organs), jaw and lateral musculature, including blood supply, afferent and efferent branchial blood vessels, brain and cranial nerves, eye muscles and their innervations, membranous labyrinth, Weberian ossicle-swim bladder connection.
2. Anatomy through model / photograph / chart / CD. of the head of any cat fish
3. Breathing organs of *Anabas*, *Clarias*, *Channa* and *Heteropneustis* showing the blood supply wherever possible.
4. Permanent preparations and study of pharyngeal denticles, cycloid and other scales.
5. Micro-technical procedures: Preparation and study of serial sections of a larval fish and representative tissues and organs of fish.
6. Local fishes and their identification upto the species level, study of the available museum specimens.

Scheme of M.Sc. III Semester Zoology: Practical (Fish Biology) Examination

Distribution of Marks

Time : 5 hrs	Max Marks: 50
SN Exercise	Marks
1. Learning of fish anatomy*	07 marks
2. Permanent preparation*	05 marks
3. Species identification using taxonomic key	08 marks
4. Microtomy	10 marks
5. Seminar	05 marks
6. Viva-voce	05 marks
7. Class Record	10 marks
Total	50 marks

Paper-Z-15 ZOOLOGY Practical (Based on Z – 11, Z – 12 & Z – 13)

1. Chordates : (a) Taxonomy : Study of museum specimens or representative animals from all chordate groups (Protochordata to Mammalia). (b) Anatomy : (i) General anatomy and neural gland of Herdmania using charts and computer software. (ii) Afferent and efferent arteries, cranial nerves, membranous labyrinth, eye muscles and their innervation ,brain of any fish. (iii) Study of fish anatomy through serial section of fry and fingerling stages. (iv) Limb musculature, cranial nerves and eye muscles and their innervation in frog dissection using computer software. (v) General anatomy, major blood vessels and cranial nerves of any nonpoisonous snake through charts / models / computer software. Study of differences between poisonous and non-poisonous snakes. (vi) Flight muscles, perching mechanism, air sacs and anatomy of the neck region in pigeon through charts / models / computer software. (vii) Reproductive system and anatomy of the neck region in rat. (c) Osteology : Comparative study of the axial and appendicular skeleton from fish to mammals, with particular reference to important skull types in amphibians, reptiles, birds and mammals. (d) Permanent preparations : Whole mounts of pelagic tunicates, cycloid scales, pecten and columella in pigeon, ear ossicles of rat or squirrel or any other mammal. (e) Histology : A detailed study of the histology of all mammalian tissues and organs through prepared slides.
2. Ecology : (a) Measurement of climatic factors (atmosphere, water, temperature and relative humidity). (b) Measurement of water and soil pH, edaphic factors of soil; preparation of soil extract, determination of humidity in microhabitat; pH, alkalinity of water, dissolved oxygen, free carbondioxide, chloride, salinity, temporary and permanent hardness of water, turbidity, velocity of current. (c) Measurement of population density. Numerical problems of population determination to be done. (d) A field study of any one of the following habitats to be assigned to an individual or to a group of students: (i) Pond habitat. (ii) Marine habitat. (iii) Terrestrial habitat.

Scheme of M.Sc. III Semester Zoology: Practical (General papers Z – 11, Z – 12 & Z – 13) Examination

Distribution of Marks

Time : 5 hrs	Max Marks: 50
SN Exercise	Marks
1. Learning of anatomy*	07 marks
2. Permanent preparation*	05 marks
3. Exercise on Ecology	08 marks
4. Spotting (Museum specimens, bones and slides) 5 spots x 2 marks	10 marks
5. Seminar	05 marks
6. Viva-voce	05 marks
7. Class Record	10 marks
Total	50 marks

II YEAR: IV SEMESTER

Paper-Z-16 ANIMAL BEHAVIOUR

Paper-Z-17 DEVELOPMENTAL BIOLOGY OF CHORDATES

Paper-Z-18 SPECIAL PAPER

Paper-Z-19 DISSERTATION

Paper-Z-20 ZOOLOGY Practical

Day 1; 5 Hrs (Z-16 & Z-17)

Day 2; 5 Hrs (Z-18).

Paper-Z-16 ANIMAL BEHAVIOUR

UNIT – I

1. Introduction of animal behaviour: definition, concept of ethology, scope and limitations.
2. Orientation: Classification of various types of taxes and kineses.
3. Methods of studying behaviour : Brain lesions; electrical stimulation, drug administration.

UNIT – II

1. Types of behaviour and their regulation: Components of feeding behaviour : Hunger drive; directional movement, avoidance, eating, carrying and hoarding.
2. Factors influencing choice of food. Nervous regulation of food and energy intake.
3. Motivated behaviour ; drive, satiation and its neurophysiological control.

UNIT – III

1. Learning: Habituation conditioned reflex; trial and error; latent learning; learning and discrimination, imprinting; neural mechanism of learning.
2. Instinctive behaviour: Concept, phyletic decent and physiology.
3. Hormones and behavior: Mammalian nervous system and involvement of hypothalamus in the regulation of behavioural patterns.

UNIT - IV

1. Social behaviour in primates: (a) Primate societies. (b) Social signals, olfactory, tactile, visual, vocal and acoustic. (c) Status: Dominance and hierarchy, territorial behaviour, courtship and mating, aggression.
2. Behaviour of domestic and zoo animals.
3. Behaviour in birds: Behaviour of *Streptopelia* (ring dove); homing and migration.

UNIT - V

1. Reproductive behaviour in fish (Stickle back or any other fish).
2. Behaviour in insects: Social behaviour, communications, concealment behaviour, role of pheromones.
3. Behavioural genetics: Single gene effect, multiple gene effect, behavioural variation in an individual; genetics and human behaviour.

Paper-Z-17 DEVELOPMENTAL BIOLOGY OF CHORDATES

UNIT – I

1. Theories of development: Preformation and epigenesis.
2. Gametogenesis (i). Spermatogenesis: Growth of spermatocyte and acrosome formation; spermeogenesis. (ii). Oogenesis: (a) Growth of oocyte and vitellogenesis. (b) Organization of egg cytoplasm; role of the egg cortex. (c) Morphogenetic determination in egg cytoplasm.
3. Fertilization: Significance of fertilization in development and the essence of activation of the egg.

UNIT – II

1. Early embryonic development. Patterns of cleavage: morulation and blastulation.
2. Gastrulation in chordates (tunicates to mammals). (a) Fate maps. (b) Mechanics of gastrulation (c) Morphogenetic movements. (d) and significance of gastrulation.
3. Primary embryonic induction: (a) Concepts of potencies; prospective fates; progressive determination, totipotency and pluripotency, nuclear transfer experiment. (b) Induction of the primitive nervous system (Spemann's primary organizer) (c) Nature & regionally specific properties of inductor. (d) Competence. (e) Abnormal (heterogeneous) inductors. (f) Chemistry and mechanism of action of inducing substances.

UNIT – III

1. Cell differentiation and differential activity. 2. Organogenesis: (a) Morphogenetic processes in epithelia and mesenchyme in organ formation. (b) Morphogenesis of brain, neural crest cells and their derivatives. (c) Development of the eye, heart, alimentary canal and its accessory organs.
3. Maternal contributions in early embryonic development.

UNIT – IV

1. Genetic regulations of early embryo development.
2. Embryonic adaptations: (a) Evolution of cleidoic egg and its structural and physiological adaptations. (b) Development and physiology of extra-embryonic membranes in amniotes. (c) Evolution of viviparity. (d) Development, types and physiology of mammalian placenta.
3. Metamorphosis in amphibia: (a) Structural and physiological changes during metamorphosis. (b) Endocrine control of metamorphosis.

UNIT – V

1. Types of regeneration, physiological, reparative and compensatory hypertrophy, regenerative ability in chordates. (b) Morphological and histological processes in amphibian limb regeneration. (c) Origin of cells of regeneration, de-differentiation, re-differentiation, (d) pattern formation during amphibian limb generation;
2. Reasons for failure of limb generation ability in other chordates and mammals; methods for induction of regenerations.
3. Abnormalities of Embryonic development: teratology.

Paper-Z-20 ZOOLOGY Practical (General)

1. **Ethology:** (a) Study of the process of learning in rat with the help of animal maize; analysis of the results with simple experiments. (b) Study of the shock and avoidance behaviour in rat. (c) Imprinting in precocial birds. (d) Chemical communication in the earthworms. (e) Study of the food preferences and feeding behaviour of an insect pest. (f) Study of the phototactic response in Tribolium/housefly. (g) Study of habituation in chicks.

2. **Developmental biology:** (a) Study of development of frog or toad through: (i) Formalin preserved or living material (egg, spawn, embryo, larvae and metamorphic stages). (ii) Permanent microscopic slides of sections through successive embryonic and larval stages. (b) Study of development of chick through: (i) Permanent whole mount of successive embryonic stages. (ii) Permanent microscopic slides of section through representative regions of successive embryonic stages. (Note: Special emphasis should be laid on organogenesis and morphogenesis). (c) Removal of chick embryos of 18,21,24,33,72 and 92 hours from the egg and their study and identification in the living state; permanent whole mounts of these embryos using living states. (d) Study of (i) formalin preserved fetuses with placenta and (ii) histology of the placenta of any mammal.

Scheme of M.Sc. IV Semester Zoology: Practical (General papers Z – 16 & Z – 17)

Examination

Distribution of Marks

Time : 5 hrs	Max Marks: 50
SN Exercise	Marks
1. Exercise on Ethology *	07 marks
2. Permanent preparation*	05 marks
3. Exercise on Development Biology	08 marks
4. Spotting (Permanent slides, Models, Photo etc.) 5 spots x 2 marks	10 marks
5. Seminar	05 marks
6. Viva-voce	05 marks
7. Class Record	10 marks
Total	50 marks

Paper-Z-18 SPECIAL PAPER

PAPER- Z – 18 (A) CELL BIOLOGY

Unit- I

1. Specialized function of cytoplasmic components in a cell with special references to the molecular mechanism (Contractibility, secretion, phagocytosis and pinocytosis).

2. Cell and tissue culture:

(a) Behaviour of cells in culture.

(b) Primary and established cell lines; kinetics of cell growth.

- (c) Natural and defined media for culture.
- (d) Importance of cell and tissue culture.
- 3. Generalized account of the mechanism of cell aggregation during development; in vitro studies.

Unit-II

- 1. Chemical basis of “fixation” and “staining” and a discussion on the following techniques.
 - a. Freeze substitution b. Freeze drying c. Fresh and fixed frozen sections d. PAS, Metachromasia, Feulgen, lipid and protein staining techniques. e. Centrifugation and ultra-centrifugation. f. Single two dimensional & column chromatography. g. Intra-vital and supra-vital staining. h. Paper, gel, SDS-PAGE and disc electrophoresis.

Unit- III

- 2. Elementary concept of the principle & theory of microscopy as exemplified by the following :
 - (a) Phase contrast microscopy (b) Interface microscopy (c) Polarizing microscopy. (d) Fluorescence microscopy (e) Electron microscopy (f) Ultra violet microscopy.

Unit- IV

- 1. A general account of the effect of ionizing radiation at the cellular level. 2. Ole and mechanism of action of the following enzymes at the cellular level (a) AT Pase (b) Succinic dehydrogenase (c) Acad and alkaling phosphatases (d) Hyaluronidase.

Unit-V

- 3. Elementary ideas of the origin of following diseases: (a) Cancer (b) Glycogen storage disease (c) AIDS 4. Cellular aspects of the process of aging 5. Cellular aspects of immunity and virus – cell interaction.

M.Sc. IV Semester - Zoology Cell Biology Practical Z-18 (A)

- 1. Study of “fixation” and “staining” techniques.
- 2. Study of microscopy techniques.
- 3. Single two dimensional & column chromatography.
- 4. Paper, gel, SDS-PAGE and disc electrophoresis.
- 5. Permanent slide preparation (Cell organelles etc.)
- 6. Elementary ideas of the origin of diseases: AIDS, Cancer and aging.

Scheme of M.Sc. IV Semester Zoology: Practical (Cell Biology) Examination

Distribution of Marks

Time : 5 hrs

Max Marks: 50

- | | |
|---|----------|
| 1. Exercise on techniques | 05 marks |
| 2. Permanent preparation (cell organelles/cell division)* | 05 marks |
| 3. Exercise on Cell and tissue culture | 08 marks |

4. Spotting (Permanent slides, Models, Photo etc.) 5 spots x 2 marks	10 marks
5. Seminar	05 marks
6. Viva-voce	05 marks
7. Class Record	10 marks
Total	50 marks

PAPER-Z – 18 (B) ENVIRONMENTAL BIOLOGY

UNIT : I

1. Impact of Human activities on environment.
2. Management of Environmental Natural resources: their conservation and development.
3. Identification of wild life of Rajasthan and local trees.

UNIT- II

1. Management of - i. Agriculture and forestry, ii. Wild life resources, iii. Mineral resources, iv. Aquaculture (Fresh water and marine) v. Energy resources vi. River basin
2. Pollution - monitoring, sources, effect and control.

UNIT-III

1. Water pollution, 2. Air pollution and land pollution 3. Thermal, noise and radiation pollution.

UNIT-IV

1. Environment and Health problems. Contamination of food resources in relation to human health. 2. Bioaccumulation, Aquatic productivity, Biomagnification, Energy flow in aquatic ecosystem. 3. Pollution control methods: bioremediation.

UNIT- V

1. Methodology for environmental analysis: a. monitoring of Air, water and soil pollution, b. analysis of physical and chemical factors of water and soil, c. Basics of bioassay techniques.

M.Sc. IV Semester - Zoology Environmental Biology Practical Z-18 (B)

1. Identification of wild life and local trees of Rajasthan.
2. Important cultivable fish species. Important predatory fishes. Important aquatic weeds.
3. Knowledge of selected local fauna and flora.
4. Identification of selected endangered wild life species of India (eg. Asiatic Lion, Tiger, Dolphins, Whales, Rhinoceros, vulture, black buck, flying squirrel, tree frog etc.).
5. Identification and comments on important culturable fish species, predatory fishes, Insects, aquatic weeds.
6. Experimental bioassay.

Scheme of M.Sc. IV Semester Zoology: Practical (Environmental Biology) Examination
Distribution of Marks

Time : 5 hrs

Max Marks: 50

SN	Exercise	Marks
1.	Exercise on Local fauna	04 marks
2.	Exercise on Local flora	04 marks
2.	Permanent preparation	04 marks
3.	Identification of 4 endangered wild life species	04 marks
4.	Experimental bioassay	04marks
5.	Identification and comments on 5 spots	10 marks
6.	Viva-voce	05 marks
7.	Class Record, Field Trip and Project Report	10 marks
8.	Seminar (internal)	05marks
Total		50 marks

PAPER- Z-18 (C) : ENTOMOLOGY (Ecology and Applied Entomology/Toxicology)

UNIT : I

1. Effects of physical factors ; population dynamics. 2. Intraspecific and interspecific relations ; host plant insect - interactions. 3. Biochemical adaptation to environmental stress. Pheremonal control of fertility in insects. 4. Embryology : Embryonic and post embryonic development ; diapause, types of larvae, pupae and metamorphosis. Role of endocrine glands in growth and development, viviparity and parthenogenesis.

UNIT : II

1. General idea of damage caused by pests. 2. Principal methods of pest control. 3. Insecticides : Types, mode of action and methods of application. 4. General idea of appliances used in the insecticide treatment and their safe handling.

UNIT : III

1. A general account of chemosterilants, attractants, repellents, pheromones, growth regulators and such other compounds. 2. Development of resistance to pesticides. 3. Insecticide synergists and antagonists.

UNIT : IV

1. Life history, damage caused and control of three major pests of each of the following crops : Wheat, paddy, maize, jowar, millet, sugarcane, cotton, mustard and soyabean. 2. Stored grain and milled product pests : *Sitophilus*, *Callosobruchus*, *Rhizopertha*, *Triboleum*, *Trogoderma*, *Oryzaephilus*. An elementary idea of storage. 3. Pests of veterinary and medical importance; preliminary idea of insect borne diseases. 4. Life cycle of aphid and locust and their control.

UNIT: V

1. A general idea of plant protection organizations in India; forensic entomology with special reference to human and wild life. 2. Beneficial insects: Silk worm, honey bee, lac insect; their economic importance and industries related to them. 3. Role of genetics in insect vector control. 4. An elementary idea of IPM.

Entomology Practical Syllabus based on Paper Z-18 (C)

1. a. Knowledge and use of equipments for rearing, collection and preservation of insects; insect net, lulling bottle, spreading board, insect-box; devices for inflating larva; light trap etc. b. Maintenance of insectaria.
2. Collection and preservation of insects and their different stages.
3. Collection of seasonal, nocturnal, aquatic insects, crop pests, stored grain pests, household pests and insects of veterinary and medical importance.
4. Familiarity with techniques and appliances used for insecticide treatment.
5. Bioassay experiments for testing the insecticides.
6. Study of food preference in stored grain pests.
7. Micro-technical procedures (microtomy).
8. Insect identification up to family level using taxonomic key.

Scheme of M.Sc. IV Semester Zoology: Practical (Entomology) Examination Distribution of Marks

Time : 5 hrs

Max Marks: 50

- | | |
|--|----------|
| 1. Study and use of insecticides and insecticides appliances | 05 marks |
| 2. Micro-technical exercise | 06 marks |

3. Toxicological exercise/Bioassay methods	05 marks
4. Insect behavior/Insect collection and preservation Techniques	06 marks
5. Insect taxonomic Key and Identification (4)	08 marks
6. Record and Insect collection/Ecological exercise	10 marks
7. Seminar	05 marks
8. Viva-voce	05 marks
Total	50 marks

PAPER- Z-18(D): FISH BIOLOGY

UNIT-I

1. Survey of principal fisheries of India (IMCs, Tuna, Mackerel, Sardine, Bombay Duck fisheries).
2. Biology of Indian major carps, catfishes, Hilsa, sardine mackerel, sharks, mahaseer, prawns and oysters.
3. Exotic fishes, larvivorous fishes, predatory and weed fishes.
4. Culture of giant freshwater Prawn.

UNIT-II

1. Aquaculture and its importance with special reference to India.
2. Different types of fish cultures viz. composite fish culture, paddy cum fish culture, culture of sea bass, milk fish and grey mullets, cage culture, air breathing fish culture, carnivorous fish culture and ornamental fish culture.
3. A detailed study of methods of fishing (crafts and gears) in fresh water of India.
4. Reservoir Fisheries Management with particular reference to Rajasthan.

UNIT-III

1. Fish preservation and processing.
2. Bio-chemical composition of fish, fish as food.
3. Fish and mankind, byproducts of fishing industry.
4. Estimation of population number and mortality rates in fresh waters.
6. Age and growth studies.

UNIT-IV

1. Limnology: Definition, types of lakes/ponds, their significance.
2. Plankton: Definition, types, diurnal variations; planktons and fisheries.
3. Water pollution and fisheries with special reference to India.
4. Aquatic weeds: types, habitat and their control.
5. Aquaria: setting up and maintenance.

UNIT-V

1. Diseases of fresh water fishes: Symptoms, etiology and treatments.
2. Specialized organs: Bioluminescent organs, electric organs, sound producing organs, poisonous and venomous glands.
3. Fish migration: Definition, types, causes and significance.
4. Adaptations to special

conditions of life: Hill stream fishes, deep sea fishes, cave dwelling fishes. 5. Application of genetics and biotechnology in fishes, Transgenic fishes and fish genomics.

M.Sc. - Zoology Fish Biology Practical based on paper Z -18(D)

1. Hydro-biological exercise: (a) Analysis of water: Determination of pH, free Carbon-di-oxide, dissolved Oxygen, chlorides, Calcium, total alkalinity, total salinity, BOD, COD. (b) Collection: Qualitative and quantitative analysis of planktons.
2. Biochemical/Physiological/Embryological exercise: (a) Estimation of glycogen in liver. (b) Determination of free amino acids of muscles or blood plasma through chromatography. (c) Induced spawning. (d) Study of development of teleost fish through preserved material (whole embryo or sections) or models/charts: eggs, cleavage, blastula, gastrula, external gill, mature larva, fry and fingerlings.
3. (a) Periodical visits to a local fishing farm to gain a firsthand knowledge of its pisciculture practices and fisheries activities. (b) A week's tour of an inland fisheries research station. (c) A week's tour of an important marine biological or fishery centre in the country.
4. Preparation and maintenance of fresh water aquarium housed with local and exotic fishes, in your department.

Note: A record of the work done under item 03 and 04 has to be submitted compulsorily by each candidate.

Scheme of M.Sc. IV Semester Zoology: Practical (Fish Biology) Examination Distribution of Marks

Time : 5 hrs

Max Marks: 50

SN	Exercise	Marks
1.	Hydrobiological exercise	07marks
2.	Exercise on Biochemistry/Physiology/Embryology	05 marks
3.	Identification and comments on 8 spots	16 marks
3.	Assignment work	06 marks
4.	Viva-voce	05 marks
5.	Field Trip and Project Report	06 marks
6.	Seminar (internal)	05 marks
	Total	50 marks

Paper-Z- 19 DISSERTATION / FIELD REPORT

The student will take a topic for detailed study from his/her special paper and will write a systematic dissertation on this topic under the supervision of faculty member of his/her own department, having the same specialization or similar to the topic of study. The format of dissertation will be the same as prescribed for M. Phil. / Ph.D. dissertation/thesis by the University of Kota. Allotment of the Supervisor will be done by the Head/In charge in consultation with the faculty members of the Department of Zoology of the institution. The topic for dissertation may be decided in III semester and dissertation should be submitted before theory examination of IV semester. Practical exam of this paper will be with that of special paper and will be comprised of *viva - voce* based on dissertation and will carry 20 marks. Evaluation of dissertation will carry 80 marks. **Total: (80+20) = 100 marks.**

FORMAT FOR FIELD REPORT

1. FRONT PAGE AS THAT OF DISSERTATION (GIVEN BELOW)
[REPLACE WORD “DISSERTATION” BY FIELD REPORT]
2. CERTIFICATE
3. DECLARATION
4. ACKNOWLEDGEMENTS
5. TABLE OF CONTENTS
6. INTRODUCTION
7. REVIEW OF EARLIER WORK DONE
8. METHODOLOGY
9. RESULTS AND DISCUSSION
10. CONCLUSIONS
11. REFERENCES

FORMAT OF M. Sc. ZOOLOGY DISSERTATION

CERTIFICATE

DECLARATION

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6.	CONCLUSION	
7.	SUMMARY	
8.	BIBLIOGRAPHY	

FORMAT OF FRONT PAGE

FISH BIODIVERSITY OF SUR SAGAR LAKE VADODARA



A

DISSERTATION

Submitted to

DEPARTMENT OF ZOOLOGY

UNIVERSITY OF KOTA, KOTA

Master of Science

ZOOLOGY

By

XYZ XYZ

Under the Supervision of

DR. XXXXX XXXX

Associate Professor

Department of Zoology,

vvvvvv, Kota (Rajasthan).

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