

**KARNATAK UNIVERSITY, DHARWAD**



**SYLLABUS  
FOR  
BACHELOR OF SCIENCE**

**ZOOLOGY  
(I TO VI SEMESTERS)**

**FROM  
2013-14 & ONWARDS**

## I SEMESTER

### PAPER 1.1 : NON-CHORDATA

**Total Teaching Hours : 70 hrs**

|      |   |        |
|------|---|--------|
| I    | INTRODUCTION  | 02 hrs |
|      | Biodiversity and its importance, Principles of animal classification definition of species  |        |
| II   | KINGDOM PROTISTA (PROTOZOA)   | 08 hrs |
|      | General characters and classification up to classes with suitable examples. Structure and life history of malarial parasite <i>Plasmodium vivax</i> and parasitic protozoan <i>Entamoeba histolytica</i>  |        |
| III  | PORIFERA  | 04 hrs |
|      | General characters and classification up to classes with suitable examples. Spicules and canal system in sponges and economic importance of sponges   |        |
| IV   | CNIDARIA  | 05 hrs |
|      | General characters and classification up to classes with suitable examples. Polymorphism in Cnidaria. Coral reefs and importance of corals  |        |
| V    | CTENOPHORA  | 02 hrs |
|      | Salient features and systematic position of Ctenophora  |        |
| VI   | PLATYHELMINTHES   | 06 hrs |
|      | General characters and classification up to classes with suitable examples. Host parasite relationship and parasitic adaptations. Life history of <i>Fasciola hepatica</i>  |        |
| VII  | ASCHELMINTHES   | 06 hrs |
|      | General characters and classification up to classes with suitable examples. Host parasitic relationship and parasitic adaptations – life history of <i>Ascaris</i> and <i>Wuchereria bancrofti</i>  |        |
| VIII | ANNELIDA  | 08 hrs |
|      | General characters and classification up to classes with suitable examples. <i>Hirudinea</i> type study – Externals, setae, digestive system; circulatory system, nervous system, nephridia and reproductive system. Tubicolous polychaetes – <i>Sabella</i> , <i>Terebella</i> , <i>Chaetopterus</i> , Ecological adaptations. |        |
| IX   | ONYCHOPHORA   | 02 hrs |
|      | Salient features of <i>Peripatus</i> and its systematic position  |        |

|     |  |        |
|-----|--|--------|
| X   | ARTHROPODA   | 10 hrs |
|     | General Characters and classification up to classes with suitable examples; Life history of <i>Butterfly</i> ; Ecology and distribution with special reference to bees, spiders, butterflies and termites. |        |
| XI  | MOLLUSCA   | 09 hrs |
|     | General Characters and classification up to classes with suitable examples. Foot and shell in mollusca   |        |
| XII | ECHINODERMATA  | 08 hrs |
|     | General Characters and classification up to classes with suitable examples. Water vascular system, Echinoderm larvae   |        |

### PRACTICAL 1.1

1. Classification of each phylum up to classes with at least one suitable example.
2. Study of Leech/Cockroach- externals, digestive system, nervous system, Jaws, nephridia, ovary of Leech, Mouth parts, salivary glands, spermatheca of cockroach.
3. Mouth parts of insects permanent slides.
4. Study of protozoan culture/frog rectal parasites.
5. Field study.

#### SCHEME OF PRACTICAL EXAMINATION

|    |  |           |
|----|--|-----------|
| 1. | Explain the _____ system in _____  | 10        |
| 2. | Protozoan culture/ Rectal parasites / nephredia / ovary/ jaw/ mouthparts / salivary glands / Spermatheca | 05        |
| 3. | Identifications (A to E)   | 10        |
| 4. | Field Study Report   | 06        |
| 5. | Viva   | 04        |
| 6. | Journal  | 05        |
|    | <b>Total</b>   | <b>40</b> |

## II SEMESTER

### PAPER 2.1 : CHORDATA

**Total Teaching Hours : 70 hrs**

|      |   |        |
|------|---|--------|
| I    | INTRODUCTION  | 06 hrs |
|      | General characters of the phylum and classification up to subphyla. Hemichordata, Urochordata, Cephalochordata with suitable examples. Retrogressive metamorphosis in urochordates  |        |
| II   | VERTEBRATA  | 02 hrs |
|      | General characters of vertebrates and outline classification  |        |
| III  | CYCLOSTOMATA  | 02 hrs |
|      | General organization and distribution   |        |
| IV   | PISCES  | 08 hrs |
|      | a. Chondrichthies: General Characters with examples   |        |
|      | b. Osteichthyes: General Characters with examples   |        |
|      | Fish migration, types of scales and fins  |        |
| V    | AMPHIBIA  | 04 hrs |
|      | General characters and classification up to orders with suitable examples   |        |
| VI   | REPTILIA  | 06 hrs |
|      | General characters and classification up to orders (living reptiles only) with suitable examples. Arcades and fosse in reptiles, Indian snakes, poisonous and non poisonous snakes.   |        |
| VII  | AVES  | 10 hrs |
|      | General characters and classification. Distinctive features of archaeornithes and neornithes with reference to palaeognathae (flightless birds), Impennae and Neognathae, giving suitable examples. Flight adaptations, beak and foot modifications. Bird migration   |        |
| VIII | MAMMALIA  | 16 hrs |
|      | General characters and classification up to orders. Distinctive features of prototheria and metatheria with examples (with special emphasis on monotremes and marsupials). Important characters of primates, Chiroptera, Cetacea, Perissodactyla. Artiodactyla, Carnivora, Rodentia, Lagomorpha and Pholidota with examples. Rat as type study – (muscular system excluded) |        |
| IX   | OSTEOLOGY   | 10 hrs |

Study of endoskeleton of *Frog* and *Rabbit*

X COMPARATIVE ANATOMY

06 hrs

Comparative account of Aortic arches, heart, brain and urinogenital systems

### PRACTICAL 2.1

1. Classification up to orders with at least one suitable example.
2. Study of Local fish/rat/chick (any one) externals, Digestive system, Circulatory system, Urinogenital system and brain
3. Endoskeleton of *frog* and *rabbit*
4. Comparative anatomy of heart and brain.

### FIELD ORIENTED PROJECTS:

1. Field Study is compulsory
2. Visit to Zoo/forest/sanctuaries/ national park/ surrounding area to study the animal diversity related to project i.e., study the fishes, amphibians, reptiles, birds and mammals.

### SCHEME OF PRACTICAL EXAMINATION

|                                      |           |
|--------------------------------------|-----------|
| 1. Explain the _____ system in _____ | 06        |
| 2. Comparative anatomy (any one)     | 05        |
| 3. Osteology (any two)               | 06        |
| 4. Identify and comment on A to D    | 08        |
| 5. Field study trip                  | 06        |
| 6. Viva                              | 04        |
| 7. Journal                           | 05        |
| <b>Total</b>                         | <b>40</b> |

### III SEMESTER

#### PAPER 3.1 : HISTOLOGY, EVOLUTION, PALEONTOLOGY AND BIOSTATISTICS

Total Teaching Hours: 70 hrs

|     |   |        |
|-----|---|--------|
| I   | HISTOLOGY   | 22 hrs |
|     | Study of histological structure and functions of the following mammalian organs   |        |
|     | a. Tongue   |        |
|     | b. Salivary glands  |        |
|     | c. Stomach  |        |
|     | d. Intestine  |        |
|     | e. Testis   |        |
|     | f. Ovary  |        |
|     | g. Liver  |        |
|     | h. Islets of Langerhans   |        |
|     | i. Thyroid  |        |
|     | j. Kidney   |        |
|     | k. Adrenal  |        |
| II  | EVOLUTION   | 20 hrs |
|     | Origin of earth, origin of life, theories of organic evolution. Lamarckism, <i>Darwin Wallace</i> theory of natural selection, Evidences in favour of evolution.  |        |
|     | Neo-Darwinism (synthetic theory of evolution, gene mutation, gene flow, genetic drift, <i>Hardy Weinberg</i> equilibrium) concept of species Speciation, allopatric and sympatric species   |        |
| III | PALEONTOLOGY  | 16 hrs |
|     | Geological time scales, fossils and fossilization. Mesozoic reptiles with a note on Indian Dinosaurs. Connecting links, living fossils, origin and evolution of horse and man   |        |
| IV  | BIOSTATISTICS   | 08 hrs |
|     | Use of statistics in life sciences, data collection, observations and variables, sampling and sampling methods, representation, tabular and graphical representations; frequency tables, line graphs, bar graphs, histograms, frequency polygon and curve and pie charts; measure of central tendency; mean; median and mode. Measures of dispersion; range, standard deviation; Standard error |        |

### PRACTICAL 3.1

1. Observation of mammalian histology slides of the organs studied in the theory paper.
2. Preparation of permanent histology slides, three slides to be submitted at the time of practical examination.
3. Evolution of man and horse (charts or models)
4. Mesozoic reptiles (charts or models)
5. Connecting links/living fossils : *Neopilina*, *peripatus*, *limulus*, *latimuria*, *sphenodon*, *archaeopteryx* and *duck billed platypus*
6. Vestigial organs
7. Biostatistics practicals
  - a. Measures of central tendency i) Obtain the mean, medium and mode, ii) Form a frequency distribution table of the data and then compute mean, median and mode.
  - b. Prepare a frequency distribution table and draw a histogram, frequency polygon and frequency curve.

#### SCHEME OF PRACTICAL EXAMINATION

|   |           |
|---|-----------|
| 1. Preparation of permanent histology slide | 08        |
| 2. Identifications                          |           |
| a. Histology – Any 4                        | 08        |
| b. Evolution – Any 1                        | 02        |
| c. Connecting links/living fossils –Any 1   | 02        |
| 3. Histology slide submission – 3 slides    | 06        |
| 4. Biostatistics                            | 05        |
| 5. Viva                                     | 04        |
| 6. Journal                                  | 05        |
|   | <hr/>     |
| <b>Total</b>                                | <b>40</b> |

## IV SEMESTER

### PAPER 4.1 : MOLECULAR CELL BIOLOGY AND DEVELOPMENTAL BIOLOGY

**Total Teaching Hours : 70 hrs**

|      |   |        |
|------|---|--------|
| I    | MICROSCOPY  | 03 hrs |
|      | Light, electron and Phase contrast microscopes  |        |
| II   | CELL AND ITS ORGANELLES   | 06 hrs |
|      | Ultra structure of prokaryotes and eukaryotes (animals cell) molecular structure and function of Plasma membrane, endoplasmic reticulum, Golgi complex, mitochondria, lysosomes, ribosomes, nucleus and nucleolus   |        |
| III  | CHROMOSOMES   | 05 hrs |
|      | Types of Chromosomes, chromosomal fine structure, heterochromatin and euchromatin, polytene chromosomes   |        |
| IV   | NUCLEIC ACIDS   | 05 hrs |
|      | Identification of genetic material, Hershey- Chase experiment, structure of DNA, Watson and Crick DNA model types of DNA, replication of DNA; RNA, Types; Structure and functions   |        |
| V    | MITOSIS AND CELL CYCLE  | 05 hrs |
|      | Stages of Mitosis, Interphase, G <sub>1</sub> S and G <sub>2</sub> phases, molecular events at different stages of cell cycle   |        |
| VI   | MEIOSIS   | 05 hrs |
|      | Phases of meiotic cycle, first meiotic division - prophase-I, leptotene, zygotene, pachytene, synaptonemal complex and recombination and diplotene, diakinesis, Mechanism of crossing over, metaphase I, anaphase I and telophase I and cytokinesis, second meiotic division, Significance of meiosis |        |
| VII  | CANCER AND CARCINOGENIC AGENTS  | 04 hrs |
|      | Types of cancer, oncogenes, carcinogenic agents, physical, chemical and biological causes of cancer   |        |
| VIII | INTRODUCTION TO DEVELOPMENTAL BIOLOGY   | 02 hrs |
|      | Scope of Developmental Biology, overview of gametogenesis   |        |
| IX   | FERTILIZATION   | 04 hrs |
|      | Types and mechanism of fertilization, approximation of gametes, fertilizin and antifertilizin acrosome reaction, amphimixis, Monospermic and polyspermic fertilization. Significance of fertilization.  |        |



|      |   |        |
|------|---|--------|
| X    | PARTHENOGENESIS   | 04 hrs |
|      | Kinds of parthenogenesis. Natural arrhenotoky, thelytoky and cyclical. Artificial parthenogenesis, significance of parthenogenesis  |        |
| XI   | CLEAVAGE  | 04 hrs |
|      | Types of cleavage, holoblastic, meroblastic, radial and spiral types with examples  |        |
| XII  | EARLY DEVELOPMENT OF FROG   | 06 hrs |
|      | Structure of frog's egg, cleavage, blastula, fate maps, gastrulation, morphogenesis, notogenesis, and neurulation   |        |
| XIII | EXTRAEMBRYONIC MEMBRANES OF CHICK   | 04 hrs |
|      | Development, structure and functions of yolk sac, amnion, chorion and allantois   |        |
| XIV  | EARLY DEVELOPMENT OF CHICK  | 05 hrs |
|      | Structure of hen's egg, cleavage, blastula, gastrulation, origin and structure of primitive streak, structure of 18, 24, 36 and 48 hrs chick embryos  |        |
| XV   | ORGANIZER PHENOMENON  | 05 hrs |
|      | Definition, potencies of the dorsal lip of the blastopore of amphibian gastrula, Brachet's experiment, experiment of Spemann and Mangold, induction, chemical nature of organizer, parts of organizer, theories of organizer phenomenon |        |
| XVI  | PLACENTA  | 03hrs  |
|      | Yalksac placenta, allantoic pleacenta, structure (morphological and histological) and functions of placenta, classification of placenta with examples   |        |

**(Unit I to VII : Cell Molecular Biology; Unit VIII to XVI : Developmental Biology)**

#### **PRACTICAL 4.1**

1. Study of fixatives and stains : Preparation of formaldehyde (4 to 10%), alcohol (70 to 100%) Boin's fluid, Carnoy's fluid, borax carmine (alcoholic), eosin (alcoholic) iron hematoxylin, acetocarmine, aceto-orcien, Schiff's reagent (Feulgen method) and Giemsa's stain.
2. Observation and study of permanent slides for mitosis, meiosis and salivary gland chromosomes
3. Squash preparation of onion root tip to study stages of mitosis
4. Squash preparation of grass hopper testis/flower bud to study stages of meiosis
5. Squash preparation of salivary gland chromosomes of Drosophila
6. Stages of development of frog : the study of cleavage stages, blastula, gastrula and neurula and various stages of tadpole
7. Observation of various stages of frog development in nature
8. Study of permanent slides of chick embryo: 18 hrs, 24 hrs, 36 hrs and 48 hrs whole mounts and T, S of 18 hrs and 24 hrs chick embryos
9. Mounting of chick embryo

## SCHEME OF PRACTICAL EXAMINATION

|   |              |           |
|---|--------------|-----------|
| 1. Composition and preparation                                    | i. Fixative  | 02        |
|   | ii. Stain    | 02        |
| 2. Stages of mitosis/meiosis (two stages)                         |              | 04        |
| 3. Squash preparation (mitosis/meiosis)                           |              | 07        |
| 4. Mounting of chick embryo                                       |              | 08        |
| 5. Identifications, Developmental stages of frog (2)<br>chick (2) |              | 08        |
| 6. Viva   |              | 04        |
| 7. Journal  |              | 05        |
|   |              | <hr/>     |
|   | <b>Total</b> | <b>40</b> |

## V SEMESTER

### PAPER 5.1 : BIOCHEMISTRY AND PHYSIOLOGY

**Total Teaching Hours : 45 hrs**

|      |  |        |
|------|--|--------|
| I    | CARBOHYDRATES, LIPIDS AND PROTEINS   | 05 hrs |
|      | Definition, classification and biological significance   |        |
| II   | ENZYMES  | 05 hrs |
|      | Classification of enzymes – IUB system, mechanism of enzyme action, enzyme substrate complex, specificity of enzymes, reversibility of enzyme action, enzyme inhibitors, a brief account of coenzymes, cofactors and ions, clinical importance of enzymes                      |        |
| III  | VITAMINS   | 04 hrs |
|      | Fat soluble vitamins (A,D,E and K) water soluble vitamins (B-complex and C) functions and deficiency symptoms  |        |
| IV   | BIOENERGETICS  | 04 hrs |
|      | Concept of bioenergetics, energy yielding pathways, glycolysis, bioenergetics of glycolysis, the Krebs's cycle, bioenergetics of Krebs's cycle, the electron transport system, phosphorylation   |        |
| V    | DIGESTION  | 03 hrs |
|      | Mechanical digestion, chemical digestion, assimilation and absorption of proteins, carbohydrates and lipids. Hormonal regulation of enzyme secretion   |        |
| VI   | RESPIRATION  | 03 hrs |
|      | External and internal respiration. Respiratory pigments, hemoglobin, hemocyanin and hemoerythrin. Physiology of respiration, exchange of gases, transport of oxygen oxygen dissociation curves, Bohr effect, transport of carbon dioxide, chloride shift, respiratory quotient |        |
| VII  | CIRCULATION  | 03 hrs |
|      | Types of circulation, structure, functions and regulation of human heart, blood pressure, Compstion of human blood, Neurogenic and myogenic hearts   |        |
| VIII | NITROGEN EXCRETION   | 03 hrs |
|      | Nitrogen excretion in aquatic terrestrial and aerial animals; ammonotelism, uruotelism and uricotelism with examples; ornithine cycloe, Physiology of urine formation in man   |        |
| IX   | MUSCLE CONTRACTION   | 03 hrs |
|      | Principal types of muscles, ultrastructure of striated muscles, role of myosin, actin, tropomyosin, troponin and actinin; Mechanism of muscle contraction and relaxation, the sliding filament theory, Chemical changes during muscle contraction, Neuromuscular junction      |        |

|     |  |        |
|-----|--|--------|
| X   | NERVOUS COORDINATION   | 03 hrs |
|     | Structure and conduction of nerve impulse in medullated and non medullated nerves, synaptic transmission and neurotransmitters   |        |
| XI  | ENDOCRINE SYSTEM   | 05 hrs |
|     | Functions of human endocrine glands, hypothalamus, pituitary, thyroid, parathyroid, islets of Langerhans, adrenal, testis, ovary, placenta and pineal gland. Hypothalamus and its stimulating and inhibitory effects |        |
| XII | IMMUNOLOGY   | 04 hrs |
|     | Components of immune system, Bone marrow, thymus, spleen, bursa of Fabricius, Peyer's patches, T and B cells, antigens and antigenicity, immunoglobulin, structure of immunoglobulin G (Ig G) and immunization       |        |
|     | AIDS : causative factors, effects and preventive measures  |        |

**(Unit I to IV : Biochemistry; Unit V to XII : Physiology)**

**PRACTICAL 5.1**

1. Biochemical tests for proteins, carbohydrates and fats
2. Normal and abnormal constituents of urine
3. Action of salivary amylase
4. Preparation of haematin crystals
5. Estimation of hemoglobin
6. Total count (TC) differential count (DC) of RBC and WBC
7. Blood clotting time
8. Demonstration of blood pressure
9. Osmotic haemolysis in blood cells

**SCHEME OF PRACTICAL EXAMINATION**

|  |           |
|--|-----------|
| 1. Qualitative test for proteins/carbohydrates/fats                              | 10        |
| 2. Normal/abnormal constituents of urine   | 05        |
| 3. Preparation of haematin crystals/clotting time/<br>Action of salivary amylase | 06        |
| 4. Hemoglobin estimation TC/DC   | 10        |
| 5. Viva  | 04        |
| 6. Journal   | 05        |
| <b>Total</b>   | <b>40</b> |

## V SEMESTER

### PAPER 5.2 : ETHOLOGY AND APPLIED ZOOLOGY

**Total Teaching Hours : 45 hrs**

|      |   |        |
|------|---|--------|
| I    | INTRODUCTION  | 02 hrs |
|      | Definition, scope of ethology, contributions of Konrad Lorenz, Niko Tinbergen and Karl Von Frisch   |        |
| II   | TYPES OF ANIMAL BEHAVIOUR   | 04 hrs |
|      | Innate behavior, taxes, reflexes, instincts and motivation, learned behavior, habituation, imprinting, conditioned reflexes and insight learning  |        |
| III  | SOCIAL ORGANIZATION IN ANIMALS  | 04 hrs |
|      | Honey bees, termites and langurs  |        |
| IV   | COURTSHIP BEHAVIOUR   | 04 hrs |
|      | General principles of courtship behavior with suitable examples   |        |
| V    | PARENTAL CARE   | 04 hrs |
|      | Parental care in fishes, amphibians and birds with suitable examples  |        |
| VI   | NESTING BEHAVIOUR   | 03 hrs |
|      | Types of Nests: Nests and nesting behavior in wasps and birds (with suitable examples)  |        |
| VII  | COLORATION AND MIMICRY  | 03 hrs |
|      | Definition, types of mimicry, Batesian Mullerian protective, aggressive and warning mimicry with suitable Indian examples   |        |
| VIII | ANIMAL COMMUNICATION  | 02 hrs |
|      | Functions of signals, odors, sounds and light   |        |
| IX   | APICULTURE  | 03 hrs |
|      | Importance, history and developments of bee keeping. Different species of honey bees and their distribution, Management of bees, product and byproducts of apiculture and their uses                                    |        |
| X    | AQUACULTURE   | 04 hrs |
|      | Fresh water, brackish and marine water fish culture in India, prawn and pearl culture   |        |
| XI   | VERMICULTURE  | 02 hrs |
|      | Introduction and importance of vermiculture. Different species of earthworm used in vermiculture, uses of earthworms for biodegradation of organic waste materials, earthworm as protein source, vermiculture technique |        |

|      |  |        |
|------|--|--------|
| XII  | POULTRY SCIENCE  | 03 hrs |
|      | Introduction, breeds of fowls, poultry keeping, nutritive value of egg and meat, poultry diseases  |        |
| XIII | DAIRY TECHNOLOGY   | 02 hrs |
|      | Introduction, breeds of cattle, breeding and cattle improvement in India nutritive value of milk and milk byproducts   |        |
| XIV  | SERICULTURE  | 05 hrs |
|      | Mulberry varieties and cultivation methods (Pit system and Row system). Types of silkworms, a. Mulberry silkworms and b. Non-Mulberry silkworms. Life history of silkworm and importance of sericulture. Silkworm rearing, chawki rearing and late age worms rearing, Mounting and harvesting. Silk worm diseases in brief |        |

**(Unit I to VIII : Ethology; Unit IX to XIV : Applied Zoology)**

### PRACTICAL 5.2

1. Identification of castes in social insects
2. Observation of courtship behavior in animals
3. Observation of parental care in animals
4. Observation of different types of nests and nest materials
5. Coloration and mimicry
6. Breeds of poultry
7. Life cycle of silk worm, study of diseases of silk worm
8. Study of commercially important
  - a. Crustaceans
  - b. Molluscs
  - c. Fishes
9. Visit to nearby dairy, poultry, sericulture farm bee keeping unit, vermiculture unit and termite mound for observation.

## SCHEME OF PRACTICAL EXAMINATION

|    |  |           |
|----|--|-----------|
| 1. | Identification   | 20        |
|    | a. Nest/Castes in social insects (any 2)   |           |
|    | b. Coloration and mimicry  |           |
|    | c. Poultry breeds  |           |
|    | d. Silkworm life cycle   |           |
|    | e. Commercially important fishes, crustaceans, molluscans, freshwater fish and marine water fish (one from each) |           |
|    | f. Courtship behavior/ Parental care (any one)   |           |
| 2. | Project report   | 10        |
| 3. | Viva   | 04        |
| 4. | Journal  | 05        |
|    |  | <hr/>     |
|    | <b>Total</b>   | <b>40</b> |

## VI SEMESTER

### PAPER 6.1 : ECOLOGY, ZOOGEOGRAPHY AND WILD LIFE BIOLOGY

**Total Teaching Hours : 45 hrs**

|      |   |        |
|------|---|--------|
| I    | INTRODUCTION  | 02 hrs |
|      | Ecological spectrum, subdivisions of ecology, scope of ecology  |        |
| II   | BIOGEOCHEMICAL CYCLES   | 05 hrs |
|      | Principles and concepts to biogeochemical cycles. Hydrological, Carbon, Nitrogen, Oxygen, Sulphur and Phosphorus cycles   |        |
| III  | ABIOTIC AND BIOTIC FACTORS  | 06 hrs |
|      | Biotic factors, light, effect of light on plants and animals. Temperature; thermal stratification, cyclomorphosis. Adaptations to extreme temperatures; soil; soil organisms; water; oxygen; carbon dioxide; fire and wind  |        |
|      | Biotic factors, animal relationships, mutualism, commensalism, parasitism, amensalism, predation and competition with relevant examples   |        |
| IV   | HABITS  | 06 hrs |
|      | Marine habitat, zonation of the sea and ecological classification of marine biota, coastal ecology, estuarine ecology and mangroves.  |        |
|      | Freshwater habitat, lentic and lotic systems. Ecological classification of fresh water animals  |        |
|      | Terrestrial habitat; a brief account of biomes  |        |
|      | Ecological adaptations to marine, freshwater and terrestrial habitats   |        |
| V    | POPULATION ECOLOGY  | 03 hrs |
|      | Population density, natality and mortality, age distribution, population growth rate, population growth curves, biotic potential, Allee's principle and Gause's Principle   |        |
| VI   | COMMUNITY ECOLOGY   | 04 hrs |
|      | Community structure, ecological determinants, ecological stratification, ecotone and edge effect, ecological niches, ecological succession, climax community, alpha, beta, gamma diversity, Shanon index. Liebig's and Shelford's laws and combined concept of limiting factors |        |
| VII  | POLLUTION   | 04 hrs |
|      | Air, Water, Soil Pollution, noise, visual and agricultural pollution, e-waste, solid and hazardous waste management with example  |        |
| VIII | GEOGRAPHIC DISTRIBUTION OF ANIMALS  | 02 hrs |
|      | Continuous and discontinuous distributions with examples, barriers of dispersal, topographic and vegetation barriers, large bodies of water as barriers, climatic barriers  |        |



|     |   |        |
|-----|---|--------|
| IX  | ZOOGEOGRAPHY  | 04 hrs |
|     | Zoogeographical realms (with subdivisions) of world, with climatic conditions and examples of characteristic fauna, a brief account of Wallace's line   |        |
| X   | DISTRIBUTION OF WILD LIFE IN INDIA  | 03 hrs |
|     | The Himalayan ranges, the peninsular India subregion, deccan plateau, western ghats, eastern hill chain, Aravali ranges, Indian desert, tropical rain forests, wildlife in Andaman and Nicobar islands  |        |
| XI  | WILD LIFE PROBLEMS  | 02 hrs |
|     | Hunting, overharvesting, habitat destruction degradation, due to over population, and possibilities of climatic changes   |        |
| XII | WILD LIFE CONSERVATION  | 04 hrs |
|     | Need for wild life conservation agencies engaged in wild life conservation. Government organization and nongovernment organizations. Wild Life Protection Act 1972, CITES: Convention on International Trade in Endangered Species of wild life flora and fauna; endangered fauna and flora of India. Red data book. Ramsar convention. CBD : convention of Biological Diversity, Project Tiger |        |

**(Unit I to VII : Ethology; Unit VIII to IX : Zoology; Unit X to XII : Wild Life Biology)**

### PRACTICAL 6.1

1. Estimation of dissolved oxygen, carbon dioxide, hardness, chloride, alkalinity and pH of water of RQ
2. Study of tropical pond as an ecosystem, study of fauna and flora and interaction between the various constituents using Charts
3. Location of species of zoological interest on the Indian map and world map, flightless birds, Tiger, Lion, Gorilla, Hippopotamus, Rhinoceros, Dipnoi and Peripatus.
4. Location of tiger reserves, national parks, biosphere reserves, wild life sanctuaries of India on map
5. Study of threatened animals of India (by models/pictures/charts) Tiger, Lion, One horned Rhinoceros, Gaur, Golden Langur, Lion tailed monkey, Musk deer, Mouse deer, Kashmir stag, Great Indian Hornbill and Indian rock python
6. Study of community by quadrat method to determine frequency, density and abundance of different species present in the community, alpha diversity
7. Study of biomass of consumers of a particular area by quadrat method- by determining the dry weight of living organisms – both animals and plants per unit area.
8. Study of ecological adaptations and morphological peculiarities- Hermit crab, Stick insect, Glow worm, Stinkbug, Pufferfish, Anglerfish, Exocoetes, Phrynosoma, Draco, Chameleon, and Bat

## SCHEME OF PRACTICAL EXAMINATION

|   |           |
|---|-----------|
| 1. Estimation                                       | 10        |
| 2. Identification-5                                 | 10        |
| 3. Project works report on ecology/wildlife biology | 10        |
| 4. Viva connected with field work report            | 05        |
| 5. Journal  | 05        |
|   | <hr/>     |
| <b>Total</b>  | <b>40</b> |

## VI SEMESTER

### PAPER 6.2 : GENETICS, BIOTECHNOLOGY AND NANO TECHNOLOGY

**Total Teaching Hours : 45 hrs**

|      |  |   |
|------|--|---|
| I    | INTRODUCTION   | 02 hrs  |
|      | Heredity and environment, definition of genotype, phenotype, Mendel and his contributions, monohybrid and dihybrid crosses   |   |
| II   | INTERACTION OF GENS  | 04 hrs  |
|      | Supplementary factors- 9:3:3:1<br>Dominant epistasis – 12:3:1  | Example : comb pattern in fowls<br>Example : plumage color in Leghorn and Wyandotte                 |
|      | Recessive epistasis - 3:3:4<br>Complementary factors 9:7<br>Lethal gene  | Example – coat color in mice<br>Example – flower color in sweet peas<br>Example- coat color in mice |
| III  | MULTIPLE ALLELES   | 03 hrs  |
|      | Inheritance of coat color in rabbit, isoalleles – psuedoalleles and position effect, ABO blood groups in human, Rh factor  |   |
| IV   | LINKING AND CROSSING OVER  | 03 hrs  |
|      | Linkage in Drosophila, theories of linkage, crossing over, cytological basis of crossing over, significance of crossing over, genetic map of chromosomes   |   |
| V    | SEX DETERMINATION  | 03 hrs  |
|      | Chromosomal mechanism of sex determination, genic balance theory, gynandromorphs and intersexes. Environmental and hormonal effects on determination of sex, Amniocentesis.  |   |
| VI   | SEX LINKED INHERITANCE   | 03 hrs  |
|      | Sex linked inheritance in Drosophila and man. Hemophilia and color blindness in man. Sex linkage in poultry. Y linked genes  |   |
| VII  | MUTATIONS  | 02 hrs  |
|      | Chromosomal aberrations, molecular basis of gene mutation and types  |   |
| VIII | HUMAN GENETICS AND EUGENICS  | 08 hrs  |
|      | Karyotype analysis: normal male, normal female, Down's syndrome, catcry syndrome, Turner syndrome, Klinefelter syndrome, and 21 trisomy; Common human genetic disorders, inborn errors of metabolism, albinism, phenylketonuria, alkaptonuria, sickle cell anemia, thalassemia, Huntingon's chorea, Eugenics |   |
| IX   | EXTRA CHROMOSOMAL ENHERITANCE  | 01 hrs  |
|      | Kappa particles in paramecium  |   |

|     |  |        |
|-----|--|--------|
| X   | GENETIC CODE AND GENE EXPRESSION<br><br>Genetic code, properties of genetic code, Wobble hypothesis, dogma of molecular cell biology, protein synthesis, Operon concept  | 04 hrs |
| XI  | Isolation of DNA, molecular cloning, gene cloning, gene library, diagnosis of hereditary diseases, DNA finger printing, PCR technique, application of biotechnology, animal cloning, transgenic animals/proteomics, genomics, human genome project | 08 hrs |
| XII | Introduction to nano science and nanotechnology, Types of nano-materials, nanobiotechnology in healthcare, environmental nanotechnology  | 04 hrs |

**(Unit I to X : Genetics; Unit XI : Biotechnology; Unit XII : Nanotechnology)**

### PRACTICAL 6.2

1. Karyotype analysis; normal male, normal female, Down's syndrome, Catcry syndrome, Turner's syndrome, Klinefelter's syndrome, and 21 trisomy
2. Mutant forms of Drosophila
3. Genetic problems; monohybrid inheritance (4), dihybrid inheritance (4)
4. Genetic problems : multiple alleles- ABO blood groups in humans (4)
5. Genetic problems : sex linked inheritance in Drosophila (2) and man (2)
6. Calculation of allele frequency – PTC (Phenyl Thio Carbamide) tongue rolling, attached ear lobes

### SCHEME OF PRACTICAL EXAMINATION

|  |           |
|--|-----------|
| 1. Karyotype analysis  | 10        |
| 2. Mutant forms of drosophila (any 2)  | 06        |
| 3. Genetic problem (5) Monohybrid, dihybrid, multiple alleles and sex linked inheritance in drosophila and man | 15        |
| 4. Viva  | 04        |
| 5. Journal   | 05        |
| <b>Total</b>   | <b>40</b> |