

Smt. Y. Jayamma

KARNATAK UNIVERSITY, DHARWAD



Syllabus
For Bachelor of Science

ZOOLOGY
(I to VI Semesters)

From
2013- 14 & Onwards

SCHEME OF STUDY AND EXAMINATIONS
OF
SEMESTERS I - VI OF BACHELOR'S DEGREE COURSE IN ZOOLOGY

1. B.Sc. Course in Zoology will be of three academic years, comprising of six semesters, two in each academic year.
2. There shall be one paper and one practical for I - IV semesters and two papers and two practicals for V and VI semesters.
3. For semesters I - IV each theory paper shall have 70 teaching hours (including 2 hours of test) and 64 hours of practical's (including 4 hours for test). For semester V and VI theory will have 45 hours and practical 64 hours of teaching.
4. There shall be a study tour during I, II, V and VI semesters. Students are required to submit the tour reports.
5. There shall be two Internal test, each of one hour duration, conducted at the 8th and 12th week of each semester. Each test should be conducted for 20 marks, later reduced to 10 marks. The average marks of two tests for 10 marks shall be taken as final internal assessment marks for the test component. The award of remaining 10 internal assessment marks should be for home assignments.
6. There shall be one practical test, to be conducted at the 12th week of the semester for 20 marks, later to be reduced for 10 marks.
7. The internal assessment marks awarded to the students shall be displayed on the notice board within two weeks from the date of conduct of the tests.
8. The practical journal/tour report/project assignment should be evaluated at the time of examination. Viva is mandatory.
9. The distribution of marks for the theory and practical is of 80 and 40 marks for each semester paper

KARNATAKA UNIVERSITY, DHAKWAD

Course Structure and Scheme of Examination for B.Sc. Degree in Zoology

(W. e. f. Academic Year 2013-14 and onwards)

Sem.	Title of the Paper	Instr. Hrs Per/Week		Examination Marks		Internal Assesment Marks		Duration of Examination		Total Marks
		Theory	Pract.	Theory	Pract.	Theory	Pract.	Theory	Pract.	
I	Paper: 1.1 : Nonchordata	5 hrs	-	80	--	20	--	3 hrs	-	150
	Practical: 1.1 : Nonchordata	-	4 hrs	--	40	-	10	--	4 hrs	
II	Paper: 2.1 : Chordata	5 hrs	-	80	--	20	--	3 hrs	-	150
	Practical: 2.1 : Chordata	-	4 hrs	--	40	-	10	--	4 hrs	
III	Paper: 3.1 : Histology Evolution and Palentology Biostatistics	5 hrs	-	80	--	20	--	3 hrs	-	150
	Practical: 3.1 : Histology Evolution and Palentology Biostatistics	-	4 hrs.	-	40	-	10	--	4 hrs	
IV	Paper: 4.1 : Molecular Cell Biology and Developmental Biology	5 hrs	-	80	--	20	--	3 hrs	-	150
	Practical: 4.1 : Molecular Cell Biology and Developmental Biology	-	4 hrs	-	40	-	10	--	4 hrs	
V	Paper: 5.1 : Biochemistry and Physiology	4 hrs	-	80	--	20	--	3 hrs	-	150
	Practical: 5.1 : Biochemistry and Physiology	-	4 hrs	-	40	--	10	--	4 hrs	
	Paper: 5.2 : Ethology and Applied Zoology	4 hrs	-	80	--	20	--	3 hrs	-	150
Practical: 5.2 : Ethology and Applied Zoology	-	4 hrs	-	40	--	10	--	4 hrs		
VI	Paper: 6.1 : Ecology, Zoogeography & Wild Life Biology	4 hrs	-	80	--	20	--	3 hrs	-	150
	Practical: 6.1 : Ecology, Zoogeography & Wild Life Biology	-	4 hrs	-	40	--	10	--	4 hrs	
	Paper: 6.2 : Genetics, Biotechnology & Nanotechnology	4 hrs	-	80	--	20	--	3 hrs	-	150
Practical: 6.2 : Genetics, Biotechnology & Nanotechnology	-	4 hrs	-	40	--	10	--	4 hrs		

11/11/14

I SEMESTER

PAPER I.1: NON-CHORDATA

Total Teaching hours : 70hrs

- 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 *Plasmodium vivax* and parasitic protozoan *Entamoeba histolytica*
- 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 *Fasciola hepatica*
- VII. ASCHAHELMINTHES 06 hrs
General characters and classification up to classes with suitable examples. Host - parasitic relationship and parasitic adaptations - life history of *Ascaris* and *Wuchereria bancrofti*
- VIII. ANNELIDA 08 hrs
General characters and classification up to classes with suitable example. *Hirudinea* type study - externals, setae, digestive system, circulatory system, nervous system, nephridia and reproductive system. Tubicolous polychaetes - *Sabella*, *Terebella*, *Chaetopterus*. Ecological adaptations
- IX. ONYCHOPHORA 02 hrs
Salient features of *Peripatus* and its systematic position

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X. ARTHROPODA

10 hrs

General characters and classification up to classes with suitable examples; Life history of *Butterfly*; 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 I.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	<u>05</u>
Total	40

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 Chondrichthyes: 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, Artidactyla, 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	

(Signature)
Chairman

Department of Zoology

PRACTICAL 2.1

1. Classification up to orders with at least one suitable example
2. Study of local *fish/rat/chick* (any one) – External, 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 of fishes, amphibians, reptiles, birds and mammals

SCHEME OF PRACTICAL EXAMINATION

1. Explain the _____ system of _____	06
2. Comparative anatomy (any one)	05
3. Osteology (any two)	06
4. Identify and comment on A to D	08
5. Field Study report	06
6. Viva	04
7. Journal	05
Total	40

III SEMESTER

PAPER 3.1: HISTOLOGY, EVOLUTION, PALEONTOLOGY AND BIOSTATISTICS

Teaching hours : 70 hrs
22 hrs.

I. HISTOLOGY

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, Darwin - Wallace theory of natural selection. Evidences in favour of evolution

Neo-Darwinism (synthetic theory of evolution, gene mutation, gene flow, genetic drift, Hardy-Weinberg 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

12 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*, *latimaria*, *living fossil*
sphenodon, *archaeopteryx*, and *duck billed platypus*
6. Vestigial organs
7. Biostatistics practicals
 - a. Measures of central tendency i). Obtain the mean, median 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
Total	40

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 & CELL CYCLE 05 hrs
Stages of Mitosis, Interphase, G₁, S and G₂ 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 hr
Scope of Developmental Biology, overview of gametogenesis
- IX. FERTILIZATION 04 hrs
Types and mechanism of fertilization, approximation of gametes, fertilizin and antifertilizin acrosome reaction, amphixis. Monospermic and polyspermic fertilization. Significance of fertilization
- X. PARTHENOGENESIS 04 hr
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 03 hrs
Yolksac placenta, allantoic placenta, 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 %) Bouin'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		08
	Developmental stages of frog (2) chick (2)		
6.	Viva		04
7.	Journal		<u>05</u>
	Total		40

- 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 cycle, bioenergetics of Krebs 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. Composition of human blood. Neurogenic and myogenic hearts
- VIII. NITROGEN EXCRETION 03 hrs
 Nitrogen excretion in aquatic,terrestrial and aerial animals; ammonotelism, ureotelism and uricotelism with examples; ornithine cycle. 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

R. K. Chatterjee
 Chatterjee

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 hematin 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 hemolysis 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 hematin crystals/ Clotting time/ Action of Salivary amylase	06
4. Hemoglobin estimation /TC/DC	10
5. Viva	04
6. Journal	05
Total	40

V SEMESTER

PAPER 5.2: ETHOLOGY AND APPLIED ZOOLOGY

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 ORGANISATION 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 byproduct

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

VI SEMESTER

PAPER 6: ECOLOGY, ZOOGEOGRAPHY AND WILD LIFE BIOLOGY

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.
Abiotic 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. HABITATS 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, Shannon 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, Aravalli 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 on Biological Diversity, Project tiger

(Unit I to VII: Ecology; Unit VIII to IX: Zoogeography; Unit X to XII: Wild Life Biology)

· PRACTICAL 6.1

1. Estimation of dissolved oxygen, carbon dioxide, hardness, chloride, alkalinity and pH of water and 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, tigers, lions, 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, glowworm, stinkbug, pufferfish, anglerfish, exocoetes, phrynosoma, draco, chameleon, and bat

SCHEME OF PRACTICAL EXAMINATION:

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

X. GENETIC CODE AND GENE EXPRESSION

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 nanoscience 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 <i>drosophila</i> (Any 2)	06
3. Genetic problem(5) - Monohybrid, dihybrid, multiple alleles and sex linked inheritance in <i>drosophila</i> and man	15
4. Viva	04
5. Journal	05
Total	40

Reference Books:

Semester I & II :

1. The Invertebrates 5 Vols : Libble Henrietta Hyman., McGraw Hill N.Y., 1995
2. Invertebrate structure and function: E.J.W. Barrington, English Language Book Soc. & Nelson House, 1981.
3. Principles of systematic Zoology :Ernst Mayr, Tata- McGraw-Hill, 1969.
4. The Invertebrata ; Borrardale, Eastham Potts and G.A. Kerkut., Cambridge Univ. Press 1977.
5. The Vertebrate body ; Romer and Parson and Parson, W.B. Saunders, Philadelphia 1978
6. The Life of Vertebrates ; J. Z. Young, Clarendon Press Oxford, 1981
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