

BHARATHIAR UNIVERSITY COIMBATORE
M.Sc. ZOOLOGY (WILDLIFE BIOLOGY) COLLEGES – CBCS PATTERN
(For the students admitted during the academic year 2016 -17 Batch & onwards)

Note: The revised syllabi for the following papers furnished below be followed and there is no change in the existing scheme of examination and syllabi of remaining papers.

SEMESTER – I
PAPER – I ANIMAL PHYSIOLOGY & ENDOCRINOLOGY

UNIT- I: Nutrition and Digestion:

Nutritive Requirements – Carbohydrates, proteins, lipids, Vitamins and minerals. Physiology of Digestion- role of salivary glands, liver, pancreas and intestinal glands in digestion. Absorption and Assimilation- hormonal control of digestion.

UNIT-II: Respiration and Circulation:

Respiratory organs-integument, gills and lungs. Respiratory pigments. Transport of gases- Bohr's effect, Chloride shift, Structure of mammalian heart. Heart beat- mechanism of circulation -origin and conduction of heart beat - Blood coagulation.

UNIT- III: Excretion and Osmoregulations: Structure of mammalian kidney- urine formation- acid-base regulation-Role of hormones in excretion -osmotic and ionic regulation in freshwater, marine and terrestrial organisms. Thermoregulations

UNIT- IV: Muscle and Nerve Physiology: Ultra Structure of skeletal muscle. Mechanism of muscle contraction- theories. Physico-chemical changes during muscle contraction. Structure of neuron – Origin and conduction of nerve impulse. Synaptic transmission -neuromuscular junction. Biological Clocks.

UNIT- V: Endocrine regulation and reproduction: Structure and functions of different endocrine glands of man- pituitary, Thyroid, Parathyroid, Adrenal and pancreas. Structure and functions of reproductive organs in man. Hormonal regulation of reproduction.

REFERENCE :

1. **Ganong, H**, Review of Medical Physiology, 1989. 14th edition, *Appleton & Lange publisher*, New York
2. **Fleur, and Strand, (1978)**. Physiology: A regulatory system approach, *Macmillan Publishing Company*, New York; *Collier Macmillan Publishers*, London.
3. **Shier, D., Butler, J. and Lewis, R., Hole's, 2003**. Human Anatomy and Physiology, (10th edition) *WCB/McGraw Hill*, Boston. 2003.
4. **Eckert, R and W.H. Freeman. 2002**. Animal Physiology, (5th edition).
5. **Williams S. Hoar (1991)** General and Comparative Physiology 3rd edition. *Prentice Hall of India*- New Delhi.
6. **Neilson, K.S., 1997**. Animal Physiology, *Cambridge University Press*, Pergamon Press, Oxford.
7. **Knut Schmidt – Nielsen, 2005**, Animal Physiology, 5th Edition, *Cambridge University Press*.

8. **Barrington, E.J.W. (1975):** An Introduction to General & Comparative endocrinology 2nd ed., Clarendon press, Oxford.
9. **Williams, R H. 1981.** Text book of Endocrinology, Ed. 6th W. B. Saunders Company, Philadelphia, London.
10. **De Groot. 1979.** Endocrinology, Vol. 1-3, Grune and Stratton, New York.
11. **Astwood, E. B. 1968.** Clinical Endocrinology, Grune and Stratton, New York.
12. **Bondy P.K. and Rosenberg L.E. 1974.** Duncan's disease of Metabolism – Genetics, Metabolism and Endocrinology. W. B. Saunders Co., Philadelphia, London.

PAPER II - CELL AND MOLECULAR BIOLOGY

Unit – I

Prokaryotic and eukaryotic cells. Plasma membrane – models and functions. Nucleus: ultra structure and Function. Cell division: mitosis and meiosis. **Significance of crossing over**

Unit - II

Ultra structure, types and functions of Ribosomes, Endoplasmic reticulum, Golgi complex, Mitochondria and Lysosome.

Unit - III

Chromosomes – structure and types. **DNA** - Watson and Crick model of double helix, different forms of double helix – A, B & Z forms. **DNA replication:** types, enzymology and mechanism of semi-conservative mode of replication.

Unit-IV

RNA structure and functions of rRNA, tRNA, and mRNA. Protein synthesis - Transcription, translation and post translation modifications.

Unit-V

Regulation of the Eukaryotic cell cycle, Cell birth, Lineage and cell death. Biology of aging. Cancer/ oncogenes, Cell markers, Cellular morphology, Kinetics of cell growth, Stem cell culture, embryonic stem cells and their applications.

REFERENCE:

1. De Robertis ED P *et al* 1987 Cell and Molecular Biology
2. Alberts B *et al* 1986 The molecular biology of the cell
3. Watson J D *et al* 1987 Molecular Biology of the Gene

PAPER III – ANIMAL BIODIVERSITY

UNIT I

Biodiversity and species concept

Components of Biodiversity – Ecosystem, Genetic and Species diversity
Species Concept – Biogeography and Speciation; Principles of Taxonomy

Animal Diversity

Animal – Distribution, Population inventory, Species richness (Dominance)

Biodiversity Hot spots – Mammals, Birds, Reptiles, Amphibians, Fishes and Invertebrates of Western GHAT region
Indo – Burma regions
Domestic Animals of India –cattle, birds, carnivores like dogs and cat

UNIT II

Loss of animal Diversity (Extinctions)

Past rate of Extinctions – Geological

Island biogeography and extinction rates of islands – Island Fauna

Human induced extinctions – Habitat loss, Degradation, Fragmentation, Population reduction, Threats

Status of Species

Isolated species – Rate, Endemic and Threatened towards extinctions

Wild species – Measurement, IUCN Red list of Indian wild life

UNIT III

Conservation Biology

Case Studies – In situ and Ex situ conservation of Indian animals

Population management – Project Tiger and Elephants;

Communities and Conservation – People participation; Success and failures of conservation action.

Tools in Conservation

Wild life data (Statistics) and methods of interpretation

Wild life maps

Remote sensing in wild life and study of Landscape

Human demography – PVA, CAMP

UNIT IV

Animal Laws and Policies in India

Protected area network Programme

Forest Policy

SPCA Act

Economics of Bioconservation

Convention on biodiversity: Objectives, principles, use of terms in situ and ex situ conservation, sustainable use of components

Convention on International Trade in endangered species – principles, regulation, exemption, signatories

Negative list of exports – Animals only

Zoo policy

Economics of biodiversity conservation

UNIT V

Conservation Education

Wild life / Animal Magazines

Writing of Popular and Scientific articles on conservation

Information on wild life – Mass media

Conservation awareness

Wild life celebration days – Games on the conservation of Wild life global programmes on

Nature and Environment
Biotechnology in conservation

REFERENCES:

1. Glimpses of Biodiversity- B.Blosetti.
2. Environmental biodiversity- P.R.Yadav
3. Biodiversity of microbial life- Stanely Reysenbach
4. Ecology & Env. Biology Sathyanarayana Books & Allied (P) Ltd

PAPER IV - GENETICS

Unit:I

Mendalism

Biography of Mendel and his experiments with pea plant

Law of Segregation :Monohybrid cross, back and test cross, Dominance and Recessive, Co-dominance and Incomplete dominance.

Law of Independent Assortment

Dihybrid crosses in Drosophila, back and test cross.

Unit II

Sex determination

Chromosomal theory of sex determination, Environment and Sex determination. Hormonal control of sex determination (free martin) Gynandromorphs / Intersexes, Supersexes in Drosophila. Sex differentiation and dosage compensation.

Gene Mutation

Definition , Types of mutations, Physical & Chemical Mutagens, Measurement of mutation rate in Bacteria, Drosophila and Human. Types of gene mutations.

Reverse mutation in bacteria, insects and human.

Unit III

Inheritance

Gene concepts classical theory – Modern theory

Multiple alleles – blood group inheritance

Extra chromosomal inheritance.

Genetic recombination

Types of recombination, molecular events during recombination

Genetic recombination in Bacteria (Transformation, conjugation, transduction, episomes and plasmids.)

Unit IV

Mapping of chromosomes

Eukaryotic, Bacterial, Viral, Bar loci, Complex locus and complementation mapping.

Gene Regulation

Operon concept – The repressor, operator and promoter genes. Developmental genes – control of gene expression and sequential gene expression in eukaryotes.

Unit V

Chromosomal aberrations

Numerical and Structural aberrations. Evolutionary significance of chromosomal

aberrations.

Extra Chromosomal Inheritance / Cytoplasmic Inheritance.

Cancer Genetics

Regulation of mitotic cell cycle in eukaryotes and intercellular communication in multi cellular eukaryotes. Properties of cancer cells. Proto oncogenes, Oncogenes, Cellular oncogenes, Tumor suppressor genes, Viral oncogenes.

REFERENCES:

1. Mitra Sardhya 1994 Genetics
2. Stickberger 1974 Genetics
3. Gardiner E J *et al* 1984 Principles of Genetics
4. Sarin C 1985 Genetics
5. Dobzhansky Th 1969 Genetics and Origin of species
6. Hart D L Population Genetics

SEMESTER - II

PAPER V - BIOCHEMISTRY AND BIOINFORMATICS

Unit I

Classification, structure and metabolism

Carbohydrates: Glycolysis, [Glycogenesis](#), [Glycogenolysis](#), Glyconeogenesis, TCA cycle, Cori cycle.

Proteins: Deamination, Transamination, Amino acid synthesis.

Lipids: Lipolysis, Beta oxidation, Steroidogenesis

Unit II

Nucleic acids

Structure and Synthesis. Degradation of Purines and Pyrimidines.

Enzymes, Isoenzymes and co-enzymes

Classification

Mechanism of action

Significance

Unit – III

Vitamins-Fat soluble and water soluble vitamins-structure and function. Coenzymes and their structures. **Antibiotics**-Structure and functions of Pencillin, Streptomycin and Chloromycetin

Unit IV

Bioinformatics

Introduction to Bioinformatics: Overview, Internet and bioinformatics, Applications.

Databases: Various biological databases, Protein and Nucleotide sequence data bases. Protein sequence, structure and Classification of databases.

Unit V

Gene prediction

Gene prediction methods: Signal sites Predictions.

Protein Computational Biology - Structural classification of proteins.

Protein structure prediction, Active site prediction, Protein modeling and drug design.

REFERENCE:

Biochemistry

1. Stryar.L. 1988 Biochemistry
2. Lehnigar. A.L. 1982 The Principles of Biochemistry
3. Abraham Mazur. 1966 Text Book of biochemistry.
4. Voet.D & Voet.J.G. 1997 Biochemistry
5. Hawk 1996 Practical Physiological Chemistry
6. Garrett.R.H. *et al* 1996 Biochemistry

Bioinformatics

1. Yaswant Khanitkar 1992 Computer Languages
2. Christopher Cavanaugh 2001 Computer Hints & Tips
3. Bipin C Desai *et al* 1999 Database Management
4. Mani.K & Vijayaraj.N. 2001 Bioinformatics.

PAPER VI - BIOPHYSICS AND BIO STATISTICS

Unit I

Bioelectricity

Membrane, Resting and action potential. Ionic distribution and membrane potential, Recording of action potential.

Radiation

Electromagnetic radiation. Laws of light absorption - Beer Lamberts law, Biological applications of X-rays, infra red rays, Ultra violet rays.

Unit -II

Bioenergetics Laws of thermodynamics, concept of free energy, oxidation reduction (redox) reactions. Energy coupling reactions, energy rich compounds, ATP cycle, standard free energy and negative entropy changes in living systems, enzyme catalysis.

Unit – III

Biological data

Source, Collection – Classification – Tabulation, Diagrammatic representation. Frequency curves, Frequency Polygon, Ogive.

Measurements and variables

Central tendency, Arithmetic mean – Median – Mode
Dispersions, Deviations, Co – efficient of variance.
Standard Deviations and standard Error.

Unit IV

Test of Samples

Sampling, distribution of samples and sampling errors.
Student “t” test, Chi – square test, f test, ANOVA one way and two way.

Unit V

Correlation & Regression

Types, Karl Pearson's co – efficient

Calculation of regression co – efficient and Significance test.

Probability

Definition, Types, Additional and Multiplication theorems.

REFERENCE:

Biophysics

1. Giese. A.C. 1969 Cell Physiology
2. Casey. 1993 Biophysics
3. Deb.A.C. 1983 Fundamentals of biochemistry.

Biostatistics:

1. Gupta S P Statistical Methods Chand & Co, Delhi.
2. Sokal R R & Rohlf F J Biostatistics Freeman, San Francisco
3. Snedecor G W & et al Statistical Methods East-West Press, Delhi.
4. Zar J H Biostatistical Analysis Prentice Hall, London.
5. Shiv Kumar Practical Statistics Chand & Sons, Delhi.
6. Rama Krishnan P Biostatistics Saras Pub., Nagarcoil.

PAPER VII - ECOLOGY

Unit I

Ecosystems and Habitat Ecology

Aquatic – Fresh water, Marine, inter tidal, Rocky, Muddy sandy – deep sea – Estuary – Terrestrial – grass land, desert & forest. Energy flow in an ecosystem Remote sensing techniques.

Unit II

Community Ecology

Organization, Stratification – Community stability. Food chain, Food Web, Ecological pyramids, Ecological Succession, Eutrophication, ecological niche, ecotone, biological magnification.

Unit III

Population Ecology

Population measurements, Growth, Fluctuations, Cycle and Equilibrium. Intraspecific and interspecific relationships.

Factoral Ecology

Physico – chemical factors – Light, Temperature, Salinity and Oxygen. Biogeochemical cycles – Water, Nitrogen, Carbon, Sulphur and Phosphorus.

Unit IV

Natural resources

Types of resources – Mineral, Forest, Agriculture, Wild life and Fishery resources.

Principles of conservation, Management of natural resources, Afforestation, Wild life Management, Fresh water fish culture.

Unit V

Pollution Ecology

Sources, effects and control of Air, Noise, Water, Land, Thermal and radioactive pollutions.

REFERENCE:

1. Odum, E. Fundamentals of Ecology W.B. Saunders, London.
2. Clarke, S. Ecology
3. Krebs, C.J. Ecology
4. Pielon, E.C. Population and Community Ecology
5. Knight, F. Concept of Ecology. Kings Pub. Co. Victoria.
6. Dash.M.C. Fundamentals of Ecology.
7. Batschelet E Introduction to mathematics for life Scientists Springer-Verlag, Berlin
8. Sokal R R & Rohlf F J Biometry Freeman, San Francisco
9. Jorgenson S E Fundamentals of Ecological Modeling Elsevier, New York.

PAPER VIII – DEVELOPMENTAL BIOLOGY AND IMMUNOLOGY

UNIT I

Fertilization

Theories of fertilization,
Process and significance of fertilization
Artificial insemination
Collection and cryopreservation of gametes & embryos
Embryo transfer technology
Invitro fertilization
Induced ovulation
Teratology – causes types & events

UNIT II

Embryonic nutrition

Yolk utilization
Types of placenta, Placental hormones
Physiology of placenta
Hormonal control of pregnancy and lactation

Induction and Organizer

Nature of induction and organizer
Physiology of induction
Experiments on inductions
Nucleoplasmic interactions

UNIT III

Outlines of Immunology

Basics of immunity – Types of immunity – Lymphoid organs – Structure and types of

Immune system.

Immunoglobulin – Structure, biological properties and functions

UNIT IV

Cells, tissues and organs of immune system

Primary and secondary lymphoid organs structure and their functions.

Cells of Immune system: Their maturation, activation, differentiation and functions.

Types of Immunity:

a. Innate immunity

b. Humoral immunity: Antigen their types; adjuvananes, epitopes as antigenic determinants; Process of antigenicity.

Antibodies (Immunoglobulins) classes and structure, Antigen and Antibody interations.

Theories of antibody formation.

c. Cellular immunity: Major and minor histocompatibility (MHC) complexes: HLA system; clinical significance of MHC & HLA

UNIT V

Immunoresponse and its regulation

Primary and secondary immunoresponse.

Immunocompetence of embryo

Hypersensitivity I, II, III & IV types with suitable examples.

Transplantation immunity – skin graft rejection

Immunoresponse to tumour antigens

Immunodiagnostic assays – ELISA, RIA; Vidal tests and their applications.

Vaccines: Types; preparation; Active and passive immunization

REFERENCE:

Development biology and Experimental Embryology

1. Balinsky B L 1970 An Introduction to Embryology
2. Reven Ch P 1858 Morphogenesis
3. Barth L G 1959 Embryology
4. Reven Ch P 1959 An outline of developmental Physiology
5. Rugh R 1952 Experimental Embryology
6. Robert *et al* 1957 Experimental in developmental biology

Immunology

1. Pawar *et al* 1984 General Microbiology
2. Roitt I 1986 Essential Immunology
3. Boyd W C 1981 Fundamental of Immunology
4. Wieser R S *et al* 1971 Fundamentals of Immunology

PRACTICAL – I

Animal Physiology & Endocrinology :

1. Determination of the rate of activity of salivary amylase (Human saliva) activity by titration method.
Ptyalin Activity in relation to temperature and calculation of Q10.
Ptyalin activity in relation Ph and calculation of Q10.
Recording of diastolic and systolic pressure during, standing, sitting & lying posture.
2. Biological responses of animals to various osmotic concentrations and their effects.
 - a. Change in weight of Earthworm in heterosmotic media.
 - b. Pattern of osmotic responses of crab in heterosmotic media.
 - c. Active uptake of Na⁺ and Cl⁻ of a fish from the environmental water and change in salinity.
3. Determination of the specific gravity of the blood of a vertebrate animal-by copper sulphate method.
4. Effect of temperature on the Oxygen consumption of fish and calculation on Q10.

Molecular Cell Biology:

1. Mounting of Polytene chromosome from the salivary gland of Chironomous Larva.
2. Squash preparation of testis of grasshopper to study the stage of Meiosis.
3. Isolation of DNA and RNA from an animal tissue (Demonstration only)
4. Study of different cells from the vertebrate animal. (Brain, Liver, Gonad, Kidney and Muscle)

Animal Biodiversity

1. Fossils Characteristics and identification of,
 - a) A Coelenterate
 - b) A Molluscan
 - c) An Echinoderm and
 - d) A Vertebrate.
2. Measurement of Biodiversity in a Terrestrial and an Aquatic Ecosystem.

Visit to Zoological parks, wildlife sanctuaries and biosphere reserves.

PRACTICAL – II

Genetics:

1. Genetic characteristics of a class room sample. Finger print, ear lobe, tongue rolling, mid digital hairs, widow's peak, inward bending of little finger.
2. Culture of Drosophila and identification of mutant characters. (from the given sample).
- 3. Estimation of allelic Frequency based on ABO Blood Group.**

Biochemistry :

1. Qualitative and quantitative estimation of Carbohydrates, Proteins and Lipids from the given samples.
2. Preparation of Haemin crystals.

3. Quantitative estimation of Haemoglobin.
4. Separation of plasma, Serum and cells from blood.
5. Colorimetric estimation of glucose from blood

Bioinformatics:

1. Use of excel sheet for data processing.
2. Acid and protein sequence databases.

Biostatistics:

1. Construction of (a) Frequency polygon (b) Histograms from the Data given
(The basic data may be from any material available around)
2. Calculation of (a) Standard deviation and (b) Correlation and (c) Student's test from the given data.

Biophysics:

1. Working principles of SEM and TEM

2. Determination of Glucose content of a given sample. (Calorimeter method)

PRACTICAL – III

Ecology:

1. Water analysis and estimation of the following parameters:
a. Calcium b. Magnesium c. Phosphate d. Silicate e. Nitrate
2. Quantitative analysis of Planktons (Fresh water / Marine)
3. Identification of Marine and Freshwater Plankton from the slides.
4. Effect of salinity on oxygen consumption of fish.

Developmental biology:

1. Regeneration study in Tadpole/Earth-worm

2. Effect of Thyroxin on the growth of tadpoles. (Demonstration only)
3. Study of Embryonic developmental stages (Frog and Chick)

Immunology:

1. Study of Antigen and Antibody reaction through the study of Blood grouping.
2. Study of Rh factor through the study of Blood grouping.

3. Widal Test

A study tour to various places of ecological importance is essential. A tour report should be submitted along with the record.