

BHARATHIAR UNIVERSITY: COIMBATORE – 641 046
PG - CBCS PATTERN
Supportive Papers offered in the Department of Zoology
(For the students admitted during the academic year 2011-2012 batch and onwards)

Scheme of Examination

Semester	Subject Code	Title of the Paper	Instructional Hours/week	Internal	External	Total Marks	Total Credits
I	10ZOO1GS	Protein Science	2	12	38	50	2
	10ZOO1GS	Molecular Endocrinology	2	12	38	50	2
	10ZOO1GS	Aquatic Biotechnology	2	12	38	50	2
	10ZOO2GS	An Introduction to Conservation Biology	2	12	38	50	2
II	10ZOO2GS	An Introduction to Toxicology	2	12	38	50	2
	10ZOO2GS	Transcriptomic Studies	2	12	38	50	2
	10ZOO2GS	Bioethics and Biosafety	2	12	38	50	2
III	10ZOO3GS	Marine Biotechnology	2	12	38	50	2
	10ZOO3GS	Medical Entomology	2	12	38	50	2

Supportive Papers: Maximum Marks - 50

Internal Marks: 12

Test - 6 Marks

Assignment - 3 Marks

Seminar - 3 Marks

External Marks: 38

Section A – 5x1=5 Marks (Question No. 1 to 5)

Choose the best Answer type. Answer all questions. All questions carry equal marks.

Section B – 3x3 = 9 Marks (Either or type – Question No. 6 to 8)

Answer all questions. All Question carry equal marks. Each answer should not exceed 1 page.

Section C – 4x6 = 24 Marks (Either or type – Question No. 9 to 12)

Answer all questions. All Question carry equal marks. Each answer should not exceed 2 pages.

Supportive – I – 1GS

PROTEIN SCIENCE

Unit –I

Structure of amino acids: basic carbon skeleton of amino acid, chemical bonds- hydrogen bond, covalent bond, π - bond, disulfide bond, peptide bond ; intrinsic and extrinsic forces maintaining protein structure – Vander Waall's force, electrostatic force. Molecular mechanism of protein folding and zymogen activation.

Unit -II

Proteins – Simple, Complex, Metallo, lipo and glycoprotein ; Structural classification of protein – Primary, Secondary, Tertiary and quarternary structure ; Functional classification of protein- Structural component of plasma membrane, receptors, enzymes, carriers, hormones and pheromones.

Unit -III

Proteomic tools: Protein extraction (TCA and Ammonium sulfate salt cutting) and separation (HPLC Method) from biological samples. Protein digestion techniques. Proteases, Cyanogen bromide and In-gel digestion.

Unit- VI

SDS PAGE and 2D Gel Electrophoresis. Protein structure prediction – primary (Edman's method), secondary (Ramachandran plot), tertiary and quaternary (NMR study), Bioinformatic tools – PDB Viewer, Rasmol, SWISS port and SCOP.

Unit –V

Mass spectrometer analysis of proteins and peptides. MALDI-TOF MS instrument. MALDI and SELDI. TOF Mass analyzer. ESI Tandem MS instruments. Tandem Mass analyzers. Triple Quadrupole Mass Analyzer. Ion-Trap Mass Analyzer. Q-TOF and Fourier Transfer-Ion Cyclotron Resonance MS instruments- Tandem Mass spectrometry. Identification of protein-protein interactions and protein complexes. Applications of Protein chips

Reference Books

1. Carl Branden; 1999. Introduction To protein Structure;; Garland Science, Sweden.
2. Anna Tramontano, 2006. Protein Structure Prediction, Wiley-VCH; USA.
3. Simon Roe 2001. Protein Purification Techniques, Fourth edition, Oxford; New York
4. Hubert Rehm. 2006, Protein biochemistry and proteomics, Academic Press, Elsevier. USA.
5. Mahmoud Hamdan and Pier Giorgio Righetti. 2005, Proteomics today, John Wiley & Sons, New Jersey, USA,
6. Daniel C. Liebler. 2002 Introduction to proteomics Humana Press, Totowas, NJ, USA,

Supportive – I – 1GS

MOLECULAR ENDOCRINOLOGY

Unit-I

Fundamentals of endocrinology – Endocrine organs in invertebrates and vertebrate system. Types of hormones: peptide hormones, steroid hormones and hormone analogs.

Unit – II

Master gland of endocrine system – Hypothalamus- Structure and function of hormone secreted by pituitary gland, Thyroid, Parathyroid adrenal and gonads.

Unit – III

Molecular interaction between hormones and their receptors – Receptors and Transducers- Types of receptors. Nuclear receptors-Structure and functions- Membrane receptors: Enzyme linked receptors-Cytokine receptors-Protein receptors and GPCR.

Unit-IV

Endocrine messenger molecules- Calcium, Calmodulin, phospholipids, polyamine, oligosaccharides and reactive oxygen species (ROS).

Unit-V

Molecular detection diagnosis of endocrine disorders: Principle, method and applications of RIA, ELISA, Western Blot. Applications of Monoclonal antibody in diagnosis of endocrine disorders.

Supportive – I – 1GS

AQUATIC BIOTECHNOLOGY

Unit-I

Introduction, Present Scenario of Aquatic biotechnology- Scope and Importance -Constraints and Recent advances in Aquaculture Biotechnology.

Unit II

Aqua farm Engineering - Selection of site, designing , Lay out and construction of Aqua farms – basic Introduction to culture techniques – Modern approach of Composite fish culture – integrated fish farming – Prawn culture.

Unit III

Feed formulation and Technology – Live feeds – feed ingredients and their selection – formulation and preparation of feed – addition of probiotics and probiotics in formulated feeds - Fishery by Products

Unit IV

Development of new Techniques for Aquaculture- Cryopreservation Techniques – Applications of Remote sensing in Conservation of management of fish faunal Diversity – Vaccine for Aquaculture- Identification of Bacterial and Viral Pathogens.

Unit V

Hormonal and Genetic approach to modern Aquaculture– Fish Genetics – Gynogenesis and Androgenesis – Induced Polyploidy - Fish breeding and Hybridization- Molecular Markers and their application in fisheries – Hormones and Modern Techniques of fish seed production – Brief account of Ova prim, Ova tide and Induced Breeding

References:

1. R.Ghosh,(2007) Fish Genetics and Endocrinology Swastik Publishers & Distributors , New Delhi.
2. A.B. Chaudhuri, (2008) Aquaculture Beyond 2000 New Horizons, Daya Publications, New Delhi.
3. NIIR Board of Consultants & Engineers (2007)Hand Book of Fisheries and Aquaculture Technology , Asia Pacific Business Press, New Delhi.
4. Biotechnology and Biodegradation (1990) D.Chakaraborthy.
5. S.K. Guptha & P.C. Guptha(2006)General and Applied Ichthyology (Fish and Fisheries, S. Chand & Company Ltd., New Delhi
6. C.M. Lalli, (1999) Biological Oceanography,

Supportive – I – 1GS INTRODUCTION TO CONSERVATION BIOLOGY

Unit – I - BIODIVERSITY; SPECIES CONCEPTS; ANIMAL DIVERSITY

What is Biodiversity? - Components of Biodiversity (Ecosystem, Genetic and Species diversity) - Assigning values to biodiversity - Species concepts - Animal diversity: (Distribution, inventory, species richness) - Biodiversity Hotspots (Western Ghats, Indo-Burma region).

Unit - II - LOSS OF ANIMAL DIVERSITY, STATUS OF SPECIES

Extinctions: Past rates of Extinctions - Threats to animal diversity in India - Status of species: Rare, endemic and threatened species - Measuring status of species in the wild - IUCN Red list (Assessments and methodologies) - Status of Indian animals.

Unit - III - CONSERVATION: TOOLS IN ANIMAL CONSERVATION

What is conservation biology? - *In situ* and *Ex situ* conservation of Indian animals (Case studies) - Project Tiger and Elephant - Captive breeding programme - Peoples participation in conservation - Tools in Conservation: Interpretation of various data on wildlife - GIS , Remote sensing - PVA and CAMP processes.

Unit - IV - ANIMAL LAWS AND POLICIES IN INDIA; ECONOMICS OF BIODIVERSITY CONSERVATION

Wildlife (Protection) Act of India (1972) - Protected Area Network - Prevention of cruelty to Animal Act - Convention on Biological Diversity - Zoo policy- Laws and their applications in Zoological parks, Wildlife sanctuaries and Biosphere reserves - Economics of biodiversity conservation.

Unit - V - CONSERVATION EDUCATION AND AWARENESS

Wildlife / Animal magazines, Journals - How to write popular and Scientific articles – Public Presentation – Designing educational resource materials– Role of NGO's and Government organizations in wildlife conservation - Wildlife documentation.

References:

1. R. B. Primack 1993. Essentials of Conservation Biology, Sinauer Associates, USA
2. G. K. Meffe and C. R. Carroll 1994. Principles of Conservation Biology, Sinauer Associates, USA
3. B. Groom bridge 1992. Global Biodiversity. Status of the Earth's Living Resources. Chapman and Hall, London.
4. R. A. Mittermeier, N. Meyers, P.R. Gil and C. G. Mittermeier 2000. Hotspots: Earth's Biologically richest and most endangered Terrestrial Ecoregions. Cemex/Conservation International, USA

5. M.E. Soule 1986. Conservation Biology: The Science of Scarcity and Diversity, Sinauer Associates Inc., USA. *M.Sc. Animal Biotech (Univ. dept) 2010-11 Page 26 of 26*
6. M. L. Reaka - Kudla, D. E. Wilson and E. O. Wilson 1997. Biodiversity II: Understanding and Protecting our Biological Resources. Joseph Henry Press, Washington, DC.
7. T. W. Clark, R. P. Reading and A.L. Clarke 1994. Endangered Species Recovery: Finding the Lessons, Improving the process. Island Press, Washington, DC.
8. <http://www.redlist.org>
9. W. V. Reid and K.R. Miller 1989. Keeping options Alive. World Resources Institute.
10. Anon. 1997. Wildlife (Protection) Act of India, Nataraj Publishers, Dehradun
11. K.J. Gaston 1996. Biodiversity: Biology of numbers and Difference. Blackwell Science, Oxford.

Supportive – II – 2GS

AN INTRODUCTION TO TOXICOLOGY

Unit -I

General Principles of Toxicology: Definition – Scope of toxicology – Recent developments – Absorption – distribution – Excretion – Bio-transformation.

Unit – II

Toxic substances Found in Water Soil, Water, Air and Food: Introduction – Inorganic poisons – organic compounds – Aromatic compounds – Heterocyclic compounds – Poisonous substances of plant and animal origin – detergents – pesticides.

Unit – III

Testing Procedures: Introduction – Bioassay – Acute toxicity, sublethal toxicity – Determination of LC 50, EC 50 and LT 50.

Unit – IV

Target Organs: Gill- Liver – Lung – Skin – Kidney – testing procedures – evaluation – antidotes

Unit – V

Risk Assessment and Applications of Toxicology: Risk assessment: Introduction – Acceptable daily intake (ADI) – Mathematical model – other procedures. **Applications:** Forensic – clinical – occupational and regulatory toxicology – toxicology and law.

Reference Books:

1. Frant C.L.V. 1991, Basic Toxicology II (Eds.), Hemisphere publishing corporation, Washington, London

2. Casarett and Doull's 1980. Toxicology: The Basic Science of Poisons.. II (Eds.) Macmillan publishing co., Inc, New York.
3. Butler, G.C. 1987, Principles of Ecotoxicology. John Wiley and Sons, Chichester.
4. Fumi Matsumura, 1980. Toxicology of Insecticides. Plenum Press, New York and London.
5. Foster L. Mayer, Donald J. Versteeg, Michael, J. McKee and Barnett A. Ratlner, 1992, Biomarkers, physiological and non-specific biomarkers. Lewis publishers, London.
6. Sambasiva Rao K.R.S. 1999. Pesticide impact on fish metabolism. (Eds.) Discovery Publishing House, New Delhi.
7. Gupta, P.K. 1985. Modern toxicology Vol. II. Metropolitan Book co. (P) Ltd., New Delhi.
8. Thomas J. Haley and William O. Berndt, 1987. Handbook of toxicology. Hemisphere Publishing Corporation, Washington.
9. Bio-pesticides in Insect Pest Management 1999. S. Ignacimuthu and Alok Sen, Phoenix Publishing House Pvt., Ltd., New Delhi.
10. Water Toxicology V.V. Metelev, Kanaev, N.G. Dzasokhova-Amerind Publishing Co., Pvt., Ltd., New Delhi.

Supportive – II - 2GS

TRANSCRIPTOMIC STUDIES

Unit - I

Transcription in bacteria: RNA polymerases- types, structure and functions-RNP- DNA interaction- promoter recognition- switching the gene on and off- gene activation by CAP. Transcription in Bacteriophages λ : The genetic switch – establishing lysogeny- analogies with *lac* operon – promoters, repressors, activators and their functions.

Unit - II

Transcription in Yeast: transcriptional machinery- the *Gal* gene expression and its regulation- experimental evidences for *Gal 4* activation, recruitment and functioning. Principle and applications of DNA microarray, Northern blotting, RT-PCR, serial analysis of gene expression (SAGE) and RNA sequencing.

Unit - III

Transcription in higher Eukaryotes: transcriptional machinery and promoters and nucleosomal templates, targets, the human interferon β gene and the *Drosophila* HSP70 gene- signal integration – combinatorial control and alternative enhancers: the human interferon β gene enhancers and *Drosophila* “*eve*” gene- DNA methylation – chromosomal position and gene expression.

Unit - IV

Transcriptome analysis: methods of RNA isolation, precipitation, cDNA synthesis, cDNA clean up , hybridization, stripping the arrays, exposure to phosphorimager screens and image analysis- applications of transcriptomic studies.

Unit - V

Principle and methods of *in vitro* and *in vivo* transcription in human cell lines (HeLa and Hepatocytes), purification of transcription factors TFIIB from *E.coli*, TFIIA, RNP-II and TFIID- EMSA and DNase I foot printing. Current scenario of human transcriptoms. RNAi in mammalian system and its applications.

Reference Books

1. Lodish, H., Baltimore, D., Berk, A., Matsudaira, P, Kaiser, C.A., Krieger, M, Scott, M.P., Zipursky, S.L., and Darnell, 2005. Molecular Cell Biology , W.H. freeman & Company, NY, USA
2. Hartl, D.L. and Jones, E.W. 1998, Genetics – Principles and Analysis, Jones and Barlett Publishers, London.
3. Brown, T.A., 2006, Genomes, John Wiley and Sons, Pvt. Ltd., Singapore.

Supportive – II- 2GS BIOETHICS AND BIOSAFETY

Bioethics is the philosophical study of the ethical controversies brought about by advances in biology and medicine. This course provides an introduction to the ethical questions that arise in the relationships among life sciences, biotechnology, and medicine. The goal of the study is ethical decision making in the context of biological information and technology.

Unit – I

Introduction to Bioethics in Biotechnology- Ethics – Bioethics - Biotechnology – Positive effects – Negative effects - Ethics in biotechnology- Biotechnology examples – Rice with Vitamin A - Slow Ripening Fruits- Saving the Banana- Virus Resistant Crops - Building with Silk- Educated Need for Fertilizers- More from the Sun- Toxic Soils- Biological Pest Controls – Fast Growing Trees- Fast Growing fish- The Monarch Butterfly Story- Consumer traits – food safety- Environmental concerns- Economic and Social Concerns.

Unit – II

Biosafety Regulations- National and International Guidelines.

Introduction – Regulation framework in various countries – USA- European Union-Canada- Australia- South Africa- Asian Region- International Guidelines.

Unit –III

CPCSEA Guidelines for Laboratory Animal Facility

Goal- Veterinary care- Animal procurement- Quarantine, Sterilization and separation – Surveillance, diagnosis, treatment and control of disease- Animal care and technical personnel- Personal hygiene- Animal experimentation involving hazardous agent- Multiple surgical procedures on single animal- Duration of experiments- Physical restraint- Physical plant- Physical relationships of animal facilities to laboratories – Functional areas- Physical relationship of animal facilities to laboratories- Functional area- Physical facilities- Environment- Animal husbandry- Activity – Food- Bedding- Water- Sanitation and cleanliness- Assessing the effectiveness of sanitation – Waste disposal- Pest control- Emergency , weekend and holiday care.

Unit – IV

GLP and Bioethics- Introduction – National Good Laboratory Practice (GLP) Programme- The GLP authority functions- Why follow Good Laboratory Practices?- The Aspiration – Who is responsible? – The IT Way- Role of a Sponsor- What are the quality standards for Clinical Trials?- Why is India a favorite destination for Clinical Trials worldwide?

Unit – V

Intellectual Property Rights - An introduction- Origin of the Patent Regime- Early patterns Act & Indian Pharmaceutical Industry – History of Indian Patent System- The Present Scenario – Basis of Patentability –Patent Application Procedure in India- Patent Granted Under Convention Agreement- Who can apply for a patent?- Patent Procedure – Opposition to Grant of Patent- Grant and Sealing- Exclusive Rights – Grant of Exclusive Rights- Special Provision for selling or distribution – Suits relating to infringements – Compulsory License- Termination of Compulsory License – Case study- Compulsory Licenses- Relief under TRIPS agreement.

Reference Books:

1. Bioethics, by Shaleesha A. Stanley (2008). Published by Wisdom Educational Service, Chennai.

Supportive – III – 3GS

MEDICAL ENTOMOLOGY

Unit-I

Introduction to the Insects. External morphology. Overview of the Class Insecta. A guide to taxonomy. Insect/parasite interactions. Structure and function of the internal organs.

Unit-II

Basic Insect Biology. Internal anatomy and metamorphosis. Epidemiological concepts. Mosquitoes and Malaria. Biology of the parasites in mosquitoes and humans. Environmentally soft insecticides and botanical control.

Unit-III

Basic mosquito biology. External anatomy, mouthparts, feeding. Malaria: The disease. Vaccine development. The disease Pathology, chemotherapy, genetic antimalarials.

Unit-IV

Mosquitoes and Filariasis. Biology of the parasites. Diagnosis, symptoms and treatment of the disease. Microbial control of mosquito vectors. Tse-tse flies and African trypanosomiasis

Unit-V

Mosquitoes and arboviruses: Dengue and dengue hemorrhagic fever and Chikungunya. Black flies and River blindness. Ticks and tick-borne disease presentations. Mites and mite-borne disease.

References:

1. The Insect Structure and Function - 4th Edition. by R. F. Chapman, USA.
2. Insect physiology by Wigglesworth, Vincent B. Sir, 1956, Methuen, Wiley edition, London.
3. Medical Entomology. 3rd Edition by Mike W Service M W Service Mike Service. Manchester, UK.

Supportive - III – 3GS

MARINE BIOTECHNOLOGY

Unit-I

Basics of Aquaculture: Introduction to Marine Biotechnology - scope and its utility in Aquaculture - Indian and World Aquaculture-Role, Status and Importance of Aquaculture, Marine ornamental fishes of India.

Unit –II

Marine Biodiversity: Marine Biodiversity - Defining and Measuring diversity, - -Marine food web dynamics - Primary, secondary and tertiary Production.

Unit – III

Principles of Oceanography and Live feed culture: Living resources of Indian sea - Marine food analysis -Live feeds in Marine Aquaculture- Artemia, Rotifers, Microalgae and Copepods.

Unit-IV

Marine Biotechnology and its Potential: Probiotics bacteria and their importance in aquaculture – Vaccines for aquaculture -PCR and other techniques for identification of bacterial and viral pathogen in aquaculture

Unit-V

Biotechnology in aquaculture: Cryo preservation techniques- Application of cryo preservation in aquaculture - Applied genetics of cultivated fishes –. Application of ocean remote sensing in Aquaculture.

References:

1. Biological Oceanography, (1999) Lalli, C.M.
2. Textbook of Marine Ecology (1989) Nair, N.B and Thampis
3. An Introduction to Marine Sciences (1988). Medius, P.S & Campell, J. J.
4. General Oceanography- An introduction (1980) Sielder, G.
5. Recent Advances in Marine Biotechnology.Vol.2 (1998) Nagabhushan.R
6. Biotechnology and Biodegradation (1990), D. Chakaraborthy.
7. Chemical Oceanography (1992). Millero & Saha, M.C.
8. Fish Genetics and Endocrinology (2007) R.Ghosh
- 9..Live feeds in Marine Aquaculture (2003)Josianne G.Stottrup and Lesley A.McEvoy
- 10.Marine Biology (2005)S.K.Dubey.