

BHARATHIAR UNIVERSITY, COIMBATORE
**M. Sc., ZOOLOGY DEGREE COURSE WITH COMPULSORY DIPLOMA (Colleges-
CBCS PATTERN)**

(For the students admitted During the Academic Year 2009-2010 Batch & Onwards)

SCHEME OF EXAMINATION

Sem	Subject and Paper		Inst. Hrs/Week	University Examinations				
				Dur.	CIA	EXT	Total	Credits
I	Paper I	Animal Physiology	6	3	25	75	100	5
	Paper II	Molecular Cell Biology and Biotechnology	6	3	25	75	100	4
	Paper III	Genetics and Evolution	6	3	25	75	100	4
		Diploma Theory Paper I	4	3	25	75	100	3
II	Paper IV	Ecology and Quantitative Biology	6	3	25	75	100	4
	Paper V	Biochemistry, Biophysics and Bioinformatics	6	3	25	75	100	5
	Paper VI	Experimental Embryology and Immunology	6	3	25	75	100	4
		Diploma Theory Paper II	4	3	25	75	100	3
	Practical I	Comprises of papers I, II and III	4	4	40	60	100	5
	Practical II	Comprises of papers IV, V and VI	4	4	40	60	100	5
III	Paper VII	Microbiology	5	3	25	75	100	4
	Paper VIII	Animal Behaviour	5	3	25	75	100	4
	Paper IX	Entomology I	4	3	25	75	100	4
	Paper X	Optional Subject – Paper I	4	3	25	75	100	4
		Diploma Theory Paper III	4	3	25	75	100	3
IV	Paper XI	Biodiversity	5	3	25	75	100	4
	Paper XII	Recent Trends in Zoology	5	3	25	75	100	4
	Paper XIII	Entomology II	4	3	25	75	100	4
	Paper XIV	Optional Subject - Paper II	4	3	25	75	100	4
	Practical III	Entomology Practical	4	4	40	60	100	5
	Practical IV	Optional Subject Practical	4	4	40	60	100	5
	Diploma Practical Comprises Diploma Theory Papers	4	4	40	60	100	3	
	Total Marks					2200	90	

Optional Subject : (any one to be chosen)

1. Environmental Biology
2. Toxicology

List of Group Elective/Diploma papers (Colleges can choose any one of the Group/Diploma papers as electives)

	GROUP A Diploma in Community Health	GROUP B Diploma in Poultry Science and Management	GROUP C Diploma in Animal Biodiversity and Conservation
Paper I/ Sem I	Environment and Health	Poultry Science and Management – Paper I	Evolution and Biogeography
Paper II/Sem II	Communicable and Non-Communicable Diseases	Poultry Science and Management – Paper II	Wildlife Biology and Conservation
Paper III/Sem III	Health Care of The Community	Poultry Science and Management – Paper III	Animal Biodiversity
Paper IV/Sem IV	Practical	Practical	Practical

Note :

1. The Syllabus for the above papers (except Toxicology – Paper I, II, Toxicology Practical and Elective Diploma papers Group –C) will be the same as prescribed for the academic year 2007-08.
2. The syllabus for Toxicology – Paper I, II, Toxicology Practical and Elective Diploma papers Group C are furnished below.

II M.Sc., SEMESTER – III

OPTIONAL – TOXICOLOGY I

UNIT I

Introduction & Scope of Toxicology

Origin – Scope –Disciplines of toxicology importance of toxicology, Toxicity – Acute & Chronic, Bioassays - methods in toxicology

UNIT II

Classification of Toxicants

Pesticides, Heavy metals, Oil and combustion, Chemicals & Radio active substances.

UNIT III

Exposure of Toxicants

Route of exposure - Absorption – Distribution – Excretion

UNIT IV

Mechanisms of Toxicants

Mode of action of xenobiotics, Target site interactions – Factors affecting xenobiotic chemicals.

UNIT V

Persistence of Toxicants

Toxic residues – Residue analysis (procedure & Techniques)

II M.Sc., SEMESTER – IV

OPTIONAL – TOXICOLOGY II

UNIT I

Environmental Toxicology

Toxicants in the environment (in lithosphere, hydrosphere, atmosphere) – Dynamics of toxicants in the environment – Bioaccumulation, Bio transformation, & Biodegradation.

UNIT II

Effect of Xenobiotics

Physiological and biochemical effects of xenobiotics of flora and fauna – Impact of toxic chemicals on enzyme systems, Translocation of toxicants

UNIT III

Toxicological Tests

Teratogenesis and Teratogenecity evaluation, Mutagens and Mutagenecity evaluation, Carcinogen and carcinogenicity evaluation.

UNIT IV

Environmental Toxic impact assessment

Impact assessment, Impact on Air quality, water quality, & solid waste. Environmental planning.

UNIT V

Safety evaluation of toxicants

Risk assessments, Safety evaluation programme.

REFERENCES:

1. Toxicology - A. Sood
2. Elements of Toxicology - Pandey and Shukla

3. Introduction to Toxicology	-	S.N. Prasad and Vasanthika kasyhap
4. Toxicology	-	P.D. Sharma
5. Pollution & Health	-	P.K.Roy
6. Concepts of Toxicology	-	Omkar
7. Biology of freshwater pollution	-	C.E.Manson
8. Ecology & Environment	-	P.D. Sharma
9. Water Supply, Waste Disposal & Environmental Engineering	-	A.K. Chatterjee

PRACTICAL IV

TOXICOLOGY

1. Acute toxicity studies – LC₅₀ using Finney's Method
2. Determination of Probit Analysis – Theory
3. Behavioural effect on fish in response to metal toxicity
4. Effect of toxicants on tissues – Histopathology of Liver, Gills and Muscle sections.
5. Determination of biochemical parameter: Protein
6. Determination of biochemical parameter: Glycogen
7. Effect of toxicants on haemoglobin content
8. Effect of toxicants on RBC counts
9. Effect of toxicants on WBC counts
10. Effect of temperature on toxicity
11. Effect of P^H on toxicity
12. Effect of copper on seed germination
13. Effect of cadmium on seed germination
14. Determination of Bioaccumulation on toxicant fishes in different organs.
15. Determination of Bioelimination on toxicant fishes in different organs.

Submission of Slides

Submission of 10 slides showing histopathology of tissues

Spotters – Related to practical

GROUP C
DIPLOMA IN ANIMAL BIODIVERSITY AND CONSERVATION

Paper: I– Evolution and Biogeography

Unit – I:

Geological time scales, fossils and fossilization, fossil histories of Invertebrates and Vertebrates, origin of protozoa, metazoa, bilateria, metamerism, symmetry, skeleton and coelom.

Unit – II:

Origin of life; theories of evolution; Neo-Lamarckism; Neo-Darwinism, micro, macro and mega evolution; morphological, taxonomical rates of evolution.

Unit – III:

Zoogeographical animal distribution, barriers, significance of island fauna, isolation and isolating mechanisms – race formation; selection natural, artificial and sexual.

Unit – IV:

Trends in Evolution channelisation of selection – mechanism of evolution. Adaptations and Co-adaptations; adaptive radiations and non-adaptive characters in biology.

Unit – V:

Genetic variations - classification and origin; genetic drift mutation; Genetic assimilation and homeostasis; non-genetic variation – age, seasonal, cast density, dependent, ecological polymorphism, mimicry and animal colorations.

Recommended Readings:

1. Glaessner, M.F: Pre Cambrian fossils, 1965. *Biol. Rev.* 37: 467-494.
2. Stahl, V: Vertebrate History: Problems in Evolution, 1985. **McGraw - Hill**, New Delhi.
3. Stokes, W.L: Essentials of Earth History: An Introduction to Historical Geology, 1960. *Prentice Hall Ltd.*
4. Colbert, E.H: Evolution of Vertebrates, 1970. *John Willey and Sons, Inc.* New York.
5. Levtrup: Phylogeny of Vertebrate, 1984. *John Willey and Sons, Inc.* New York.
6. Smith: Evolution of Vertebrate structure, 1953. *John Willey and Sons, Inc.* New York.
7. Carter, G.S: Animal Evolution, 1951. *Sedgwick and Jackson*, London, England
8. Mayer, S: Systematic and origin of species, 1942. *University Press*, Columbia.
9. Sobrig and Sobrig: Population Biology and Evolution, 1981. *Addison Wiley*.

GROUP C

DIPLOMA IN ANIMAL BIODIVERSITY AND CONSERVATION

Paper: II - Wildlife Biology and Conservation Unit – I

Biogeography of India and patterns and distribution of ecosystems, ecological succession, biotic and abiotic factors of an ecosystem with special reference to tropical rain forests. Taxonomy of common Indian wild animals of reptilia, aves and mammalia. Geography of India and the pattern of distribution of fauna and flora.

Unit – II

Natural history of wild life; population patterns, habits, habitats, habitat selection, resting behaviour; nutritional and reproductive strategies of common wild animals such as the calotes, poisonous and non-poisonous land and water snakes; crocodiles, birds of prey and other insectivorous, frugivorous, nectivorous and seed feeding birds, wild mammals of the Indian region.

Unit – III

Social behaviour such as aggregation, sexual behaviour, migration and territorial behaviour in birds and mammals; means of dispersal and barriers of dispersal, group size and spacing carrying capacity.

Unit – IV

Wildlife conservation: Extermination and extinction, endangered species; effects of environmental degradation on wildlife and its conservation; administrative regulations, laws and their applications in Zoological parks, wild life sanctuaries and Biosphere reserves.

Unit – V

Wild life management; Tropic structure of wildlife, common diseases of wildlife; Wild life sanitation, management of wildlife, Zoo planning and management and tourism development in wild life sanctuaries.

Recommended Readings:

- Dasmann, R.F. 1982. : **WildLife Biology**, Wiley eastern Ltd. New Delhi.
Krishnan, M: **India's WildLife**, 1972. *Bombay Natural His. Soc.*
Mani, M.S. : **Ecology and Biogeography of India**, 1974. *Junk. Publ.* The Hague.
Giler, R.F. : **WildLife Management and Techniques**, 1971. *WildLife Soc.*
Tracey, P.D. : **WildLife in India – Conservation and Control**, 1963. Ministry of Agriculture Govt. India.
Hind, R.A.: **Animal Behaviour**, 1966. McGraw Hill, New York.
Stillwell, F.: **The wards of WildLife**, 2004. *W.W.F.*
Seber, G.A.F.: **The estimation of animal abundance and related parameters**, 1973. *Chapman and Hall.*
Gee, E.P. : **The WildLife of India**, 1964. *Colling London.*
Puri, G.S.: **Indian Forestry Ecology**, 1984. *Oxford Book House.* Calcutta.
Leopold, A. : **Game Management**, 1933. *Charles Scribers Press*, New York.
Keith, Lloyd, B.: **Wildlife's ten years cycle**, 1979. *Univ. of Wisconsin Press*, Madison.
David, L. : **The natural regulation of animal numbers**, 1979. Oxford, *Clarendon Press.*
Leopold, A.: **A Sand country Almanac**, 1987. *Oxford University Press*, N.Y.

GROUP C

DIPLOMA IN ANIMAL BIODIVERSITY AND CONSERVATION

Paper: III - Animal Biodiversity

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 - Concepts of Island biogeography and extinction rates on Islands - Human induced, Modern and local extinctions - Population reduction-threats to wildlife (examples)- Habitat loss, degradation and fragmentation. 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) - Population management -Project Tiger and Elephant - Captive breeding programme - peoples participation in conservation - Successes and failures of conservation actions in India (Case study) -**Tools in Conservation:** Interpretation of various data on wildlife - GIS - remote sensing - Landscape model – 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 - forest policy - Prevention of cruelty to Animal Act - Convention on Biological diversity, International Trade in endangered species - 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 - Magazine and Journal information - Wildlife, nature, environment games (examples) – Role of NGO's and Government organizations in wildlife conservation - Wildlife celebration days in India - Biotechnology in conservation.

Selected 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. Groombridge 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. R. A. Mittermeier, P.R. Gil and C. G. Mittermeier 1997. Megadiversity: Earth's Biological Wealthiest Nations, Cemex, SA
6. M.E. Soule 1986. Conservation Biology: The Science of Scarcity and Diversity, Sinauer Associates Inc., USA.
7. 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.
8. T. W. Clark, R. P. Reading and A.L. Clarke 1994. Endangered Species Recovery: Finding the Lessons, Improving the process. Island Press, Washington, DC.
9. Anon. 1992. Convention on Biological Diversity - Text and annexes. World Wide Fund for Nature - India.
10. <http://www.redlist.org>
11. W. V. Reid and K.R. Miller 1989. Keeping options Alive. World Resources Institute.
12. Anon. 1997. Wildlife (Protection) Act of India, Nataraj Publishers, Dehradun
13. K. J. Gaston 1996. Biodiversity: Biology of numbers and Difference. Blackwell Science, Oxford.

GROUP C

DIPLOMA IN ANIMAL BIODIVERSITY AND CONSERVATION

Paper: IV – Practical

(Evolution and Biogeography, Wildlife, Biology and Conservation and Animal Biodiversity)

I. Evolution and Biogeography:

Fossils Characteristics and identification:

1. Coelenterate – Coral (Carboniferous)
2. Arthropoda – Trilobite (Silurian)
3. Mollusca – Lamellibranch (Recent)
4. Mollusca – Gastropod (Tertiary)
5. Mollusca – Ammonite (Jurassic)
6. Echinodermata – Crinoid (Carboniferous)
7. Echinodermata – Echinoid (Jurassic)
8. Vertebrata – Shark's tooth (Miocene)

Fossil specimens:

Fish vertebra, dextral snail, sea urchin fossil brachiopods fossil, animal tooth fossil, fossil of fish, fossil cast of archaeopteryx lithographica, fossil cast of trilobite and fossil of pecten.

II. Wildlife Biology and Conservation & Animal Biodiversity:

1. Inventories/Surveys.
2. Field Techniques.
3. Identification and use of keys – Reference specimen.
4. Collection and preservation.
5. Introduction to computerized techniques – Remote sensing CAMP and GIS and their modules for conservation.
6. IUCN Red List Exercise and PVA modeling.
7. Statistical analysis/interpretation.
8. Technical writing and reporting of field studies.
9. Public presentation.
10. Field Project/ Report – Visit to Zoological parks, wildlife sanctuaries and biosphere reserves.

**M.Sc., Zoology
(General Model Practical Question Paper)**

Time : 4 Hrs

Max. Marks : 60

***PATTERN A**

Section A

Major Practical (Procedure, Tabulations, Calculations, Result, Discussion) 25

Section B

Minor Practical (i)..... 10

Section C

Spotters (A) Question I 3 x 5 = 15
(B) Question II
(C) Question III

Section D

Record 10

60

***PATTERN B**

Section A		
Major Practical (Procedure, Tabulations, Calculations, Result, Discussion)		20
Section B		
Minor Practical	(i).....	10
Section C		
Spotters	(A) Question I (B) Question II	2 x 5 = 10
Section D		
Submission of slides (10) / insect box		10
Section E		
Record		10
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		60

DIPLOMA PRACTICALS

Time : 4 Hrs

Max.Marks : 60

Section A		
Major Practical (Procedure, Tabulations, Calculations, Result, Discussion)		25
Section B		
Minor Practical	(i).....	10
Section C		
Spotters	(A) Question I (B) Question II (C) Question III	3 x 5 = 15
Section D		
Record		10
		<hr/>
		60