



**Swami Ramanand Teerth
Marathwada University,
Nanded.**

B.Sc. III Year

Zoology Syllabus

Semester Pattern

With effect from June 2011

**SWAMI RAMANAND TEERTH MARATHWADA
UNIVERSITY, NANDED
B.Sc. THIRD YEAR.
SEMESTER PATTERN
ZOOLOGY- SYLLABUS
W.E.F. JUNE – 2011
SEMESTER –V**

Sr. No.	Paper No.	Title of the Paper	Periods / Practicals	Marks
1	Paper XII (Theory)	Ecology and Zoogeography	45	50
2	Paper XIII (Theory)	Applied Zoology A) Aquaculture B) Parasitology-I C) Entomology-I D) Environmental Biology	45	50

SEMESTER – VI

Sr. No.	Paper No.	Title of the Paper	Periods / Practicals	Marks
1	Paper XIV (Theory)	Ethology, Biometry & Bioinformatics	45	50
2	Paper XV (Theory)	Applied Zoology A) Pisciculture B) Parasitology-II C) Entomology-II D) Environment pollution.	45	50
3	Paper XVI (Practical)	Based on Theory Paper-XII & XIV	--	50
4	Paper XVII (Practical)	Based on Theory Paper-XIII & XV	--	50
Total Marks				300

B.Sc. III Year – Zoology
SEMESTER PATTERN -V
PAPPER XII
ECOLOGY AND ZOOGEOGRAPHY

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Periods: 45

=====
Max.Marks:50
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UNIT – I

- | | |
|---|----|
| 1. Introduction to ecosystem | 06 |
| 1.1 Concept of ecosystem | |
| 1.2 Components of an ecosystem – Abiotic and Biotic component | |
| 1.3 Pond Ecosystem and Desert Ecosystem | |
| 1.4 Acclimation and ecological amplitude | |
| 2. Atmosphere | 04 |
| 2.1 Biosphere | |
| 2.2 Impact of ozone layer | |
| 2.3 Green house effect | |

UNIT – II

- | | |
|--|----|
| 3. Population Ecology – Characteristics of Population | 05 |
| 3.1 Population density | |
| 3.2 Natality | |
| 3.3 Mortality | |
| 3.4 Age distribution | |
| 3.5 Population growth | |
| 4. Biotic interaction | 04 |
| 4.1 Positive interactions – Commensalism, Mutualism | |
| 4.2 Negative interactions – Competition, Predation, Parasitism | |

UNIT – III

- | | |
|--|----|
| 1. Pollution – Sources, Effects and Control | 06 |
| 1.1 Air Pollution | |
| 1.2 Water Pollution | |

2. Wildlife conservation and endangered species 07

2.1 Aims of wildlife conservation

2.2 Necessity of conservation

2.3 Management and conservation of wild life

2.4 Endangered species and actions to save endangered species

2.5 Wild life of India

UNIT – IV

3. Energy Resources 08

3.1 Conventional energy resources

3.2 Non-conventional energy resources

4. Zoogeographical realms with extent areas – Physical features and fauna 06

4.1 Ethiopian realm

4.2 Australian realm

4.3 Indian / Oriental realm

B.Sc. III Year
Zoology
SEMESTER PATTERN – VI
PAPER XIV
ETHOLOGY, BIOMETRY AND BIOINFORMATICS

Periods: 45

Max. Marks: 50

UNIT – I

- | | |
|--|-----------|
| 1. Introduction of Animal Behaviour | 01 |
| 2. Classification of Animal Behaviour | 08 |
| 2.1 Inborn or stereotyped animal behaviour – Taxis, Instincts and Reflexes | |
| 2.2 Acquired animal behaviour – Learning behaviour and Reasoning behaviour | |

UNIT – II

- | | |
|--|-----------|
| 3. Social Behaviour in Insects | 04 |
| 3.1 Honey bee and Ants | |
| 4. Communication Animal Behaviour | 04 |
| 4.1 Audiotary communication | |
| 4.2 Chemical communication | |
| 5. Mimicry and Colouration | 02 |

UNIT – III

- | | |
|--|-----------|
| 1. Collection of Data, Classification and Tabulation | 03 |
| Geographical, Chronological, Quantative, Qualitative, Continious, Discontinious. | |
| 2. Graphic Representation of Frequency Distribution | 04 |
| 2.1 Frequency polygon curve | |
| 2.2 Ogive curve - Cumulative frequency curve | |
| 3. Measures of Central Tendency | 04 |
| 3.1 Arithmetical Mean, Median and Mode | |
| 3.2 Measures of variability – Standard deviation & standard error | |

UNIT – IV

4. Computers and Programmes

15

- 4.1 Programming languages
- 4.2 Operating systems
- 4.3 Internet, Connectivity, World Wide Web
- 4.4 NCBI (National Centre for Biotechnology Information)
- 4.5 IP Address (Internet Protocol Address)
- 4.6 Biological Database and its significance.
- 4.7 Objectives of Database
- 4.8 Properties of Database
- 4.9 Classification of Biological Database
- 4.10 Uses of Bioinformatics.

B.Sc. III ZOOLOGY
PRACTICAL
ECOLOGY, ZOOGEOGRAPHY.
ETHOLOGY, BIOMETRY AND BIOINFORMATICS
Paper XVI

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Total Marks- 50
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- 1) Estimation of Dissolved O₂ from Water Sample.
- 2) Estimation of Dissolved CO₂ from Water Sample.
- 3) Estimation of Chlorides & Salinity from Water Sample.
- 4) Estimation of Population Density from Water Sample/ Terrestrial area.
- 5) Museum study of Vertebrate Endangered Species on the Basis of Charts/Models/Photographs (Any Five)
- 6) Determination and study of Atmospheric Humidity.
- 7) Problems Based on Mean, Mode, Median
- 8) Classification of Data
 - i) Histogram
 - ii) Pie-Diagram
 - iii) Polygon Frequency Curve
- 9) Problems based on Analysis of frequencies (Continuous and Discrete Frequencies).
- 10) Study of Positive and Negative Phototropism with suitable Animals.
- 11) Study of social Behaviors of Insects (Honey bees, Ants).
- 12) Study of biotic interaction in animals.
- 13) Study and Observation of Protective Coloration in Animals,
- 14) Study and Observation of Mimicry.
- 15) Study of Computer Application in Biology.
- 16) Computer Application in Statistical problems.
- 17) Computer Application in Graphic Representation / Data Representation.

Reference Book:

- 1) Animal Behaviour- M.P. Arora, Himalaya publication.
- 2) Animal Behaviour- vinod Kumar, Himalaya publication.
- 3) Principles of Ecology-Odum, Sunder Publication.
- 4) Introduction to Bioinformatics- S.Sundara Rajan, R.Balaji, Himalaya Publication.
- 5) Animal Behaviour- Arumugam, Saras Publication.
- 6) Evolution & Biostatistics- N.Arumugan, Saras Publication.
- 7) Biostatistics- S.P. Gupta
- 8) Ecology- Arumugam, Saras Publication.
- 9) Economic Zoology, Biostatistics and Animal Behaviour- Shukla, Mathur, Prasad, Upadhyay.
- 10) Animal Behaviour, Concept, Process and Method(Wadsworth)-Drickamer & Vessey.
- 11) Biology of Animal Behaviour- Grier
- 12) Introduction to Ethology (Plenum Press)- Immelmann
- 13) The Foundation of Ethology – Lorenz
- 14) An Introduction to Animal Behaviour- Manning
- 15) Animal Behaviour in Laboratory and Fields- Prince and Stoker
- 16) Ecology, Individuals, Populations and Communities-Begonm, J.L.(BlackWell science, Oxford, UK)
- 17) Ecological Concept- Cherrett J.M.(BlackWell science, Oxford, UK)
- 18) Fundamental of Ecological modeling-Jorgensen S.E.(Elsevier, New York)
- 19) Animal Behaviour: A synthesis of ethology and comparative Psychology- Hinde R.A.(Mcgraw-Hill New York)
- 20) Bioinformation- A Biologist Guide to Biocomputing & Internet- Brown, S.M. Eaton Publication New York
- 21) Fundamental Concept of Bioinformation- Krane & Raymer, Persons Education, 2003
- 22) Introduction to Bioinformation – Attwood & Parry- Smith, Persons Education, 2003

Swami Ramanand Teerth Marathwada University, Nanded
Annual Pattern of Practical Question Paper
B.Sc IIIrd year Zoology
Paper – XVI
(ECOLOGY, ZOOGOGRAPHY, ETHOLOGY, BIOMETRY AND
BIOINFORMATICS)

Time- 4 hrs

Total Marks- 50

Q 1) Estimation of dissolve O₂ / CO₂ from the given water sample. 08

Q 2) Estimation of Chlorides / Salinity from the given water sample.

OR

Show any two search engines on web site. 07

Q 3) To determine the Atmospheric humidity. 05

OR

To study the positive and negative phototropism with suitable examples.

Q 4) Identify and describe endangered species and biotic interaction of animals.

(Any two endangered species and any two examples of biotic interaction). 12

Q 5) Give the diagrammatic representation of data with

Histogram / Pie-Diagram / Frequency Polygon Curve. 08

OR

Solve any two problems based on Mean, Mode & Median.

OR

Solve any two problems based on analysis of Frequencies (Continuous & Discrete).

Q 6) Record Book. 05

Q 7) Excursion report and Viva – Voce.

05

B.Sc. III Zoology
Pattern of Question Paper
Semester Pattern (Sem.-V and Sem.-VI)
Theory Paper XII, XIII, XIV, XV

Time: - Max.

Marks: - 25

Q1. Write in brief on the following (05)

- a) Based on Unit I
- b) Based on Unit II
- c) Based on Unit III
- d) Based on Unit IV
- e) Based on Unit I to IV

Q2. Write short answer of the following (any two) (10)

- a) Based on Unit I
- b) Based on Unit II
- c) Based on Unit II
- d) Based on Unit IV

Q3. Write long answer of the following (any one) (10)

- a) Based on Unit – I or II
- b) Based on Unit – III or IV

B.Sc. III Zoology
Pattern of Question Paper
Semester Pattern (Sem. V and Sem. VI)
Theory (MCQ) Paper XII, XIII, XIV, XV

Time: Max.

Marks: 15

Q1. Choose correct answer of the following Multiple Choice

Questions (15 questions one mark to each)

Note: Minimum three and Maximum four questions from each Unit.

B.Sc. III Year
SEMESTER PATTERN-V
Applied Zoology
Paper XIII (A)
Aquaculture

Periods: 45

Max.Marks: 50

Unit I

1. Introduction to aquaculture

- i) Scope and importance of aquaculture
- ii) Concepts of extensive, intensive.

2. Types of aquaculture

- i) Monoculture
- ii) Polyculture
- iii) Integrated fish farming – Paddy cum fish culture

Unit II

3. Culture methods

- iv) Pen culture
- vi) Cage culture
- vii) Raceway culture

4. Sewage fed fish culture

- i) Composition of sewage
- ii) Treatment of Sewage
- iii) Use in culture

Unit III

5. Aquatic weeds and their control

- i) Types of weeds
- ii) Advantages and Disadvantages of weeds
- iii) Weed Control – Manual, Mechanical, Chemical and Biological

6. Man made hazards and Aquaculture

- i) Domestic Sewage – Composition and effects.
- ii) Agricultural Sewage - Composition and effects.
- iii) Industrial Effluents - Composition and effects.

Unit IV

7. Characteristics of water

- i) Physical properties of water
- ii) Chemical properties of water
- iii) Biological properties of water

8. Aquarium keeping

- i) Construction of Aquarium
- ii) Setting of Aquarium
- iii) Maintenance of Aquarium

B.Sc. III Year
SEMESTER PATTERN-VI
Applied Zoology
PAPER XV (A)
Pisciculture

Periods: 45

Max.Marks:50

Unit I

1. Fish farm engineering

- i) Topography
- ii) Soil type
- iii) Water supply
- iv) Layout of fish farm

2. Fish farm management

- i) Preparation and Management of Nursery pond.
- ii) Preparation and Management of Rearing pond.
- iii) Preparation and Management of Stocking Pond.

Unit II

3. Biology of Indigenous and Exotic carps.

4. Induced Breeding – Hypophysation

- i) Historical back ground
- ii) Technique of Induced breeding
- iii) Recent trends in induced breeding
- iv) Bundh breeding
- v) Chinese hatchery.

Unit III

5. Fishing Methods

- i) Gears –
Traps, Gill nets, Cast nets, Drag nets

ii) Crafts-

Masula, Catamaron, Odum, Vanchi

iii) Recent advances in fishing methods – Electrical Fishing, Light Fishing and Fish finder

6. Fish diseases

i) Parasitic diseases – Symptoms and treatment

a) Fungal

b) Protozoan

c) Helminth

d) Arthropod

Non parasitic diseases

ii) Environmental fish diseases

iii) Nutritional diseases

Unit IV

6. Fish preservation and processing

a) Causes of spoilage of fish

b) Methods of fish preservation –

Chilling, Freezing, Freezing-drying, Smoking, Drying, Salting and Canning.

7. Fish by product

Reference Books:

1. Fish and fisheries of India- Jhingran.
2. Fresh water fish pond culture and management – Marilyn Chakroff.
Pace crops scientific publishers – Jodhapur.
3. World fish farming cultivation and Economics- E.E. Brown
Avt. Publishing Co. U.S.A. 1983.
4. Aquaculture – Bardach J.E. J.H. Ryther and W.O. meharney wiley –
India science, New York.
5. Aquaculture- R.J. Reay – Arnold- Heive mann Publishers, India,
6. An Introduction to fishes – S.S. Khanna, Central book Dept. Allahabad.
7. A Manual of fresh water aquaculture – R.Sonthanam, N.Sukumaran and
P.Niligajan.
8. A text book of fishery science and Indian fisheries –C.B.C. Shrivastav
Kitalb Mahal, Nagpur.
9. Principles of Ecology- P.S. Varma, V.K. Agrawal- S.Chand Publication.
10. Elements of Ecology – N.Arumugam, Saras publication, Nagracoil,
Kanyakumari.
11. Prawn and Prawn fisheries of India- Kurian C.V. and Substian.
12. Fish Biology and Indian Fisheries- R.P. Parihar, Central Publishing
House, Allahabad.
13. Encyclopedia of fishes and fisheries of India- Pandey A.K. and Sandhu.
14. Fisheries in India- Misra S.B.
15. Fisheries Global Perspective – Cherunilam.
16. Fish and fish products – Winton A.L.
17. Pond & fish culture - Hall C.B.
18. Fishes – Chand Mary
19. Fishery Management – Agrawal.
20. Costal Aquaculture in India- Santhanam R.
21. Marine Fisheries of India- Virbhadrarao and Bal.
22. Introduction to fish technology- Regenstein.
23. Fresh water fish culture- Wankhede and Deshmukh.
24. Aquaculture Development- Amitabh Patel, S.N. Pathak.
25. A Text book of Aquaculture- Rao K.R.S.S., Reddy M.S.,
Discovery Publication, Delhi.

PRACTICAL
B.Sc. III
APPLIED ZOOLOGY
Aquaculture and Pisciculture
Paper XVII (A)

Marks 50

1. Identification of Fresh Water Fishes and Indigenous and exotic carps. (any Ten)
2. Identification of Marine Water Fishes. (Any five)
3. Identification of Aquarium Fishes. (Any five)
4. Identification of Phytoplankton. (any five)
5. Identification of Zooplanktons. (any five)
6. Study of aquatic weeds. (Any five)
7. Estimation of Dissolved Oxygen in water sample.
8. Estimation of Carbon dioxide in Water Sample
9. Estimation of Chloride in water sample
10. Examination of Stomach contents of two types (Carnivorous and Herbivorous) Fishes to study feeding habits.
11. Identification of Fishing Crafts and Gears (Model). (Three each)
12. Study of Fish Parasites. (Any three)
13. Dissection of Brain, Pituitary Gland, Cranial nerves and weberian ossicle from Labeo.
14. Visit to Fish Breeding Farm.
15. Submission of project work.

B.Sc. III
Pattern of Skeleton Question Paper
APPLIED ZOOLOGY
Practical – Paper XVII (A)
Aquaculture and Pisciculture

Time: - 4.00 Hrs.

Max. Marks: - 50

Q1. Dissect out / Expose Brain, Pituitary Gland, Weberian Ossicle, and cranial

Nerves. (Any one) (10)

Or

Examine Stomach Contents of Given Fish and comment on its Feeding habits.

Q2. Estimate Dissolved Oxygen / Carbon dioxide / Chlorides from the given Water

Sample. (10)

Q3. Identify and describe phyto and Zooplankton. (any three) (06)

Or

Identify and describe Aquatic Weeds (any three)

Or

Identify and describe Gears / Crafts / Fish Parasites. (One from each group)

Q4. Identify and Describe Fresh Water / Marine Water Fishes / Aquarium Fishes.

(One from each group) (09)

Q5. Project Work. (10)

Q6. Record Book and Viva–Voce. (05)

**B.Sc. Third Year
Applied Zoology
(Semester-Vth)
Syllabus (Theory)
Parasitology-I,
Paper No. XIII (B)
(Parasitic Protozoa and Platyhelminthes)**

Periods: 45

Marks: 50

Unit -1 – Parasitic Protozoa:

1. Classification and general organization of parasitic protozoa.
2. Geographical distribution, morphology, life-cycle, pathogenecity and control measures of –
 - i) *Trypanosoma gambiense*
 - ii) *Giardia intestinalis*
 - iii) *Trichomonas vaginalis*

Unit - 2

1. Geographical distribution, morphology, life-cycle, pathogenecity and control measures of –
 - i) *Balantidium coli*
 - ii) *Entamoeba histolytica*
 - iii) *Entamoeba coli*
 - iv) *Sarcocystis cruzi*
 - v) *Eimeria tenella*

Unit - 3

1. Parasitic platyhelminthes – Introduction.
2. General organization of Trematodes and cestodes.
3. Geographical distribution, morphology, life-cycle, Pathogenecity and control measures of –
 - i) *Taenia saginata.*
 - ii) *Echinococcus granulosus.*
4. Reproductive organs of Trematodes and cestodes comparative account.

Unit - 4

1. Geographical distribution, morphology, life-cycle, Pathogenicity and control measures of –

- i) *Schistosoma haematobium*.
 - ii) *Paragonimus westermani*.
 - iii) *Gastrodiscoides hominis*.
2. Parasitic adaptations in Trematodes and cestodes.
 3. Host- Specificity.
 4. Larval forms in Trematodes and cestodes.

**B.Sc. Third Year,
Applied Zoology
(Semester-VIth)
Parasitology-II,
Paper No. XV (B)
(Parasitic Nematodes and Arthropodes)
w.e.f. June 2011**

Periods: 45

Marks: 50

Unit -1

Parasitic Nematodes.

1. Parasitic nematodes - Introduction.
2. General organization of parasitic nematodes.
3. Geographical distribution, morphology, life-cycle, pathogenecity and control measures of –
 - i) *Enterobius vermicularis.*
 - ii) *Ancylostoma duodenale.*
4. Larval forms in Nematodes.

Unit - 2

1. Geographical distribution, morphology, life-cycle, pathogenecity and control measures of –
 - i) *Wuchereria bancrofti.*
 - ii) *Dracunculus medinensis.*
 - iii) *Trichinella spiralis.*
2. Parasitic adaptations in Nematodes.

Unit – 3

Parasitic Arthropodes:

1. Morphology, life-cycle, diseases and control measures of –
 - i) Ticks. ii) Mites.
2. Parasitic flies (Any four),
3. Mosquitoes as a vector in the transmission of Malaria, Dengue fever, Elephantiasis, Yellow fever and their control measures.
4. Parasitic Hemiptera – *Cimex lecturalis.*

Unit – 4

1. Morphology, pathogenecity and control measures of –
 - i) *Siphonaptera.*
 - ii) *Anopleura.*
 - iii) *Mallophaga.*
 - iv) *Hymenopter*

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Syllabus (Practical)

B.Sc. Third Year,

Applied Zoology

Parasitology

Paper No. XVII (B)

w.e.f. June 2011

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Marks: 50
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Section – A

1. Identification, classification and description of permanent slides of -

- i) *Trypanosoma*.
- ii) *Balantidium coli*.
- iii) *Entamoeba histolytica*.
- iv) *Eimeria tenella*.
- v) *Trichomonas*.

2. Collection staining, identification and description of –

- i) *Trypanosoma* from rat blood with Gimsa's stain.
- ii) Flagellates from the rectum of frog or calotes.
(with Gimsa's stain).
- iii) *Balantidium*, *Nyctotherus* and *Opalina* from rectum of frog.

Section – B

1. Identification, classification and description of permanent slides of –

- i) *Schistosoma haematobium*.
- ii) *Fasciola hepatica*.
- iii) *Taenia saginata*.
- iv) *Echinococcus granulosus*.
- v) *Enterobius vermicularis*.
- vi) *Ancylostoma duodenale*.
- vii) *Ascaris lumbricoides*.
- viii) *Wuchereria bancrofti*.
- ix) *Dracunculus medenensis*.

2. Collection, preservation, staining, identification, classification and description of
Helminths from –

- i) Fish
- ii) Rat
- iii) Fowl
- iv) Goat / Sheep

Section – C

1. Collection, preservation, classification and description of –

- i) Bedbug.
- ii) House fly.
- iii) Mosquito.
- iv) Head louse.

2. Preparation of permanent slides of mouth-parts of –

- i) House fly.
- ii) Mosquito.
- iii) Honey bee.
- iv) Bed bug.

List of recommended books:

1. Animal parasitology C.P. Read
2. Biology of Protozoa Sleials
3. Protolozoology Kudo
4. An introduction to parasitology Chandler
5. General Parasitology Cheng
6. Biology of Parasites Cheng
7. Nematode Parasites N.D. Levine
8. Structure of Nematode A.F. Bird
9. An introduction to Nematology Chitwood
10. Clinical Parasitology Faust
11. Medical Helminthology Watson
12. Parasitology K. D. Chatterji
13. Indian insect Life Lefrey
14. Hand book Entomology T.V. R Ayyar
15. Useful and destructive insect Metacalf & Flint
16. Applied Parasitology Hiware, Jadhav & Mohekar
17. Nematodes of Indian Mammals H.S. Nama , G. B. Shinde & B.V. Jadhav

B.Sc. III
APPLIED ZOOLOGY
THEORY PAPER- XIII (C) Syllabus
ENTOMOLOGY -I
SEMESTER –V

Periods: 45

Marks: 50

Unit I

1. General Character of class insecta.
2. Methods of collections, preservation and study of insects.
3. Insect mouth parts: Biting and chewing, piercing and Sucking, sponging and siphoning type.

Unit II

4. Type Study- **Cockroach**, classification, External characters, Digestive system, Respiratory system, Nervous System, Reproductive System.

Unit III

1. Study of Insect orders:
Salient features with suitable examples of following orders:
Thysanura, Orthoptera, Odonata, Hymenoptera, Lepidoptera Coleoptera.

Unit IV

2. Types of Metamorphosis in insect.
3. Hormonal and pheromonal control of metamorphosis in insect.

B.Sc. III
APPLIED ZOOLOGY
THEORY PAPER- XV (C) Syllabus
ENTOMOLOGY -II
SEMESTER –VI

Periods: 45

Marks: 50

Unit- I

1. Beneficial insects: (Classification, External Morphology, Life Cycle and Economic Importance)
 1. Silkworm and sericulture.
 2. Honey and apiculture
 3. Lacinsect and lac-culture.

Unit- II

2. Household and human insect pest: Structure, Binomics and control measures of Housefly, Mosquito, Ratflea, Bed bug, head louse.
3. Study of non-insect animal pests and their control.
Ex. Rat, Pig, Monkey, Birds, Ticks and Mites.

Unit III

1. Agriculture pests from this area: classification Binomics, Control measures of the following.
 - a. Cotton-Boll worm, red cotton bug.
 - b. Jawar-stem borer, Midge fly.
 - c. Sugarcane- Pyrilla
 - d. Oil seeds – ground nut White grub, Safflower-aphid
 - e. Fruits- Lemon butter fly
 - f. Mango- Stem borer, stone weevil.
 - g. Stored grain pest- Rice weevil.

Unit IV

1. Insect control methods.
 - h. Chemical control and safe handling of pesticides.
 - i. Biological control.
 - j. Physical and Mechanical control.
 - k. Hormone and phermon as a control agents.

1. Integrated pest control of insects.
 - m. Transgenic control of insects.
2. Insect ecology: Effect of light temperature, humidity and food on insect life,

B.SC.-III
APPLIED ZOOLOGY
PRACTICAL PAPER- XVII(C)
ENTOMOLOGY

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Max. Marks -50

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1. External morphology of Cockroach.
2. Dissection: Digestive System, Nervous System and Reproductive System.
3. Mounting of mouthparts of insect: Biting and Chewing, piercing and sucking, siphoning and spooning.
4. Methods of collection and preservation of insects.
5. Whole mounting of various insects and its identification (Minimum-10)
6. Museum Study: (Atleast 10 specimens preferably from different insect orders to be selected)
 - a. Thysanura
 - b. Orthoptera.
 - c. Odonata.
 - d. Hymemoptera.
 - e. Lepidoptra.
 - f. Coleoptera.
7. Study of House hold and Human insect pests: Rat flea, Bed bug, Housefly, Head louse, Mosquito.
8. Study of various stages of metamorphosis of following insects.
Silk moth, Honeybee, Cockroach.
9. Study of non insect animal pest:
 - a. Rat b. Bird c. Monkey d. Pig e. Deer
10. Collection & Identification of agriculture insect pests from local area. (Minimum 10).
11. Study tour: At least two visits to the crop field.

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,
NANDED
Question paper pattern
B.SC.-III
ZOOLOGY
PRACTICAL PAPER- XVII (C)
ENTOMOLOGY**

Time: 04 hours

Max. Marks: 50

Q1. Dissect ----- so as to expose its----- system 10

Q2. Make a temporary mount of material provided

Or

Describe the given insect as per the instruction 05

Q3. Comment on Metamorphosis stage of material provided (any two)

Or

Identify and comment on insects "A-E" as per the instructions 10

Q4. Identify and comment on insects pests (1-5) as per the instruction

(3-crop pests, 1-human pest, 1-non insect pest) 10

Q5. Project work (Entomology) / Excursion report. 10

Q6. Record book & Viva-Voce. 05

RECOMMENDED BOOKS FOR ENTOMOLOGY:

1. K. K. Nayar, Tnant Kirshnanand B.W. David- General and applied Entomology.
2. C.L. Metcalf and W.P. fling- Destructive and useful inset.
3. Hemsing pruthi : A text book of Agricultural Entomology
4. Wigglesworth: Principles of insect physiology.
5. ESSIG: College entomology.
6. M.S. Mani: A text book of General Entomology.
7. Government of Maharashtra. : Crop pests and how to fight them.
8. Oldoyd, N.: A collection, preserving and studying insects.
9. Roger P. and Anderson: Forest and shade tree entomology.
10. D.B. Temphare : Modern Entomology
11. R.E. Fradt : Fundamentals of Applied entomology.
12. K.C.V. Smith: Insects and other arthropods of Medical
13. D.N. Ray and A.W.A Brown: Entomology medical and veterinary
14. Chandler A.C. and Read C.P. introduction of Parasitology.
15. P. Debatch : Biological control of natural enemies.
16. Apple J.L. and Smith R.F.: Integrated pest management.
17. Cheny : General Parasitology.
18. Corbet J.R.: The biochemical mode of action of pesticides.
19. Champman R.F.: Insects – Structure and function.
20. O.W. Richards and R.G. Davies: Imms text book of Entomology
21. Bursell E.: An introduction to insect physiology.
22. Rockstein M Vol. (I-VI): The physiology of insects.
23. Shrivastave K.P. Vol (I-III): A text book of applied Entomology
24. Hohanson O.A.: Ebryology of insects and Myriopods.
25. Ross H.A.: A text book of Entomology.
26. Srivastava K.P.: A Text of applied Entomology – II

**B.Sc. Third Year
Applied Zoology
Paper - XIII (D)
Environmental Biology
Semester V**

Period: 45

Marks : 50

Unit - 1

1. Introduction in Biology:

- a. Atmosphere: Structure and composition.
- b. Hydrosphere: Physico - chemical properties of water.
- c. Lithosphere: Soil profile and process of soil formation.

2. Biogeochemical cycles:

- a. Hydrological cycle,
- b. Nitrogen cycle,
- c. Carbon cycle,
- d. Sulphate cycle.

Unit - II

3. Ecosystem:

- a. Concept and components.
- b. Energy flow in ecosystem.
- c. Ecological pyramids.
- d. Food chains and Food web

4. Marine Ecosystem:

- a. Zonation in Marine habitat.
- b. Intertidal habitat.

Unit - III

5. Biodiversity

- a. Importance of Biodiversity
- b. Threats to Biodiversity: Habitat loss, poaching of wild life,
"Man wild life" conflicts.
- c. Biodiversity of India
- d. Biodiversity conservation.

i) Ex- Situ conservation

ii) In- Situ Conservation

Unit - IV

6. Wild life and its conservation:

a. Aims of wildlife conservation

b. Management and Conservation of wild life.

c. Sanctuaries and zoological parks in Maharashtra.

**B.Sc. •Third Year
Applied Zoology
Paper - XV (D)
Environmental Pollution (D)
Semester VI**

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Period: 45

Marks: 50
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Unit – 1

- a) Introduction to Environmental pollution biodegradable and non biodegradable pollutants.
- b) Water pollution: Sources and effects.
- c) Pollution by sewage and domestic wastes eutrophication and algal blooms.
- d) Pollution by heavy metals; Sources and effect of Lead and Mercury

Unit – II

Air Pollution: Sources and effect of major air pollutants:

- a) Thermal power plants, Industrial chimney wastes, Automobile exhausts.
- b) Sulphate compounds as air pollutants: sources and effects.
- c) Oxides of Nitrogen as air pollutants: sources and effect.
- d) CO₂ and CO as pollutants: sources and effect.
- e) Acid rains.
- f) Ozone as protector and destroyer.
- g) Chlorofuoro carbons (CFCs)
- h) Photochemical smog.

Unit – III

- a. Radioactive pollution: Sources and effect.
- b. Pollution by solid wastes.
- c. Noise pollution: Sources and effects.

Unit – IV

- a) Pollution control legislation: Environmental (Protection) (1986 Act)
- b) Environmental Education in India:
- c) Water Resources
- d) Infiltration gallflies and wells
Water treatment methods
Sedimentation tank.

Aerobic treatment

Trickling filters.

Anaerobic treatment

Imhoff tank

Practical Syllabus
Environmental Biology And Environmental Pollution
paper XVII (D)

Marks - 50

- 1) Measurement of Relative Humidity.
- 2) Estimation of dissolved oxygen in water sample.
- 3) Estimation of CO₂ in Water sample.
- 4) Estimation of Organic matter in Soil Sample
- 5) Detection of NPK in soil
- 6) Determination of pH of water by Digital pH meter / by narrow meter range pH paper.
- 7) Estimation of total dissolved solids (TDS) in water.
- 8) Study of suspended solids in water
- 9) Study of Phytoplankton & Zooplankton in fresh water.
- 10) Effect of heavy metals / pesticide on O₂ consumption of Crab / Fish any Suitable animal.
- 11) To study effect of H₂S gas pollutant on plant, parts
- 12) Effect of pollutant / pesticide on heart beats of frog/ any suitable animal.
- 13) Study of fresh water ecosystem - visit to a pond / a river for on the spot study.

**B.Sc. THIRD YEAR
PATTERN OF QUESTION PAPER
PRACTICAL EXAMINATION
SUBJECT: ZOOLOGY
(ENVIRONMENTAL BIOLOGY AND ENVIRONMENTAL POLLUTION)
PAPER: XVII (D)**

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Time: 4 HOURS

Maximum Marks: 50

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Q1. Estimate dissolved Oxygen / Carbon dioxide in given water sample. 10

Q2. Measure the relative humidity of atmosphere. 10

OR

Estimate of NPK in the Soil / Dissolved solids / suspended solids in water.

Q3. Find of effect of heavy metals on O₂ consumption from given animal. 10

OR

Find of effect of pesticide on O₂ consumption from given animal.

OR

Detection of PH of water sample with help of pH meter / narrow pH paper.

OR

Effect of H₂ S gas of Plant part.?

Q4. Identify and Describe Phytoplanktons / Zooplanktons from water sample. 05

Q5. Project work. 10

Q6. Viva voce and Record Book. 05

List of Books:

1. P.S. Verma and V.K. Agrawal : Environmental Biology
2. P.D. Sharma : Environmental Biology
3. P. D. Sharma : Toxicology
4. E. P. Odum : Fundamentals of Ecology
5. Ranganalla : Water and Waste water Engg.
6. P. D. Sharma : Microbiology
7. Kndosia : Water Pollution
8. M. V. Rao : Air Pollution
9. National Env. Engineering
Research, (NEERI) Nehru Marg. 440020: Manual on water waste analysis
10. Trivedi & Goel P.K.: Chemical and Biological methods for water pollution studies
(Published by Environmental publisher KARAD)
11. Trivedi P.R. & Raj Gurudeep : Environmental water & soil analysis
12. Trivedi P.R. & Raj Gurudeep : Environmental Air analysis (published by Akashdeep
Pub.House,New Delhi.)