

ANNUAL SYSTEM

**BHUPAL NOBLES'
UNIVERSITY, UDAIPUR**



FACULTY OF SCIENCE
UNDERGRADUATE PROGRAMME
(Courses effective from Academic Year 2017-18)

BHUPAL NOBLE'S UNIVERSITY
B.Sc.-Three Year Degree Course
First Year T.D.C. Science, 2017-2018
Zoology (ANNUAL SCHEME)

The first year TDC examination shall consist of three theory papers, each of three hours duration and a practical examination of five hours duration.

Paper-I: Life and diversity of animals-I (Invertebrates)

Paper-II: Cell biology

Paper-III: Developmental Biology

Practical:

Pattern of question paper in the annual examination and distribution of marks:

Each theory paper in the annual examination shall have three sections i.e. A, B, and C. In section A, total 15 questions will be set in the paper, selecting at least three from each unit. Answer any 2 question from each unit in 50 words. These questions to be answered in a word or sentence. Each question carries 0.5mark, total 05 marks. Answer any 2 question form each unit.

In section B, there shall be total 10 questions, selecting two questions from each unit, five questions to be answered by the student selecting at least one from each unit. Answer should be given in approximately 250 words. Each question carries 04 marks, total 20 marks.

In section C, 05 descriptive type questions will be set in the examination paper from five units of the syllabus of the paper, selecting not more than one question from each unit. Each question may have two sub divisions. Students are required to answer any two questions approximately in 300 words. Each question is of 5 marks, total 10 marks.

Bhupal Nobles` University, Udaipur
Faculty Of Science
Department Of Zoology
Scheme Of Studies
Bsc I Year (Annual Scheme)

S. No.	PAPER	NOMENCLATURE	COURSE CODE	UNIVERSITY EXAM	INTERNAL ASSISMENT	MAX. MARKS
1.	Paper I	Life & Diversity Of Animals-I (Invertebrates)	ZOOL 111	35	15	50
2.	Paper II	Cell Biology	ZOOL 112	35	15	50
3.	Paper III	Developmental Biology	ZOOL 113	35	15	50
4.	Practical	Zoology	ZOOL114	75	-	75

The marks distribution of internal assisment-

- 1. Mid Term Examination – 10 marks**
- 2. Attendance – 5 marks**

First Year T.D.C. Science, 2017-2018

Zoology

Paper- I (ZOOL111)

Life and diversity of animals-I (Invertebrates)

Unit 1

1. Introduction to taxonomy: Definition, Rules of nomenclature, five kingdom classification, hierarchy of categories.
2. General characters and classification of Protozoa up to classes with examples and their economic importance.
3. Type study: *Paramecium*
4. Parasitic protozoans: pathogenesis and morphology of *Entamoeba histolytica*, *Trypanosoma gambiense*.

Unit 2

5. General characters and classification of Porifera up to classes with examples and their economic importance.
6. Type study-*Sycon*
7. Canal system in sponges
8. General characters and classification of Coelentera up to classes with examples and their economic importance.

Unit 3

9. Type study-*Obelia*
10. Corals and coral reefs-their formation, kinds and importance. Polymorphism in Coelenterata, Metagenesis.
11. General characters and classification of Platyhelminthes and Ashelminthes up to classes with examples
12. Type study- *Fasciola hepatica*, *Wuchereria bancrofti*.

Unit 4

13. Helminthes parasites in relation to human diseases, parasitic adaptations of trematodes, cestodes and nematodes.
14. General characters and classification of Annelida and Arthropoda up to classes with examples.

15. Type study- *Nereis*, *Palaemon*

16. Mouth parts of insects

Unit 5

17. Social organization in insects

18. General characters and classification of Mollusca, Echinodermata and Hemichordates up to classes with examples

19. Type study- *Pila*, *Asterias*, *Balanoglossus*

20. Affinities of Hemichordata

First Year T.D.C. Science, 2017-2018

Zoology

Paper- II (ZOOL112)

Cell Biology

Unit 1

1. Cell theory and modern interpretation, types of cell, Structure and General Characteristics of prokaryotic and eukaryotic cells.
2. Plasma membrane: fluid-mosaic model, functions of Plasma membrane

Unit 2

3. Cilia and flagella
4. Centriole and basal bodies
5. Brief idea of cell-cycle (General description of Mitosis and Meiosis).
6. Cytoplasmic skeleton -Microtubules and Microfilaments

Unit 3

7. Structure and functions of nucleus.
8. Nucleic acids: Watson and Crick model of DNA, Basic idea of other models, chemical nature of DNA, types of DNA, replication of DNA.
9. Structure and function of nucleolus.
10. Chemical nature and Structure of various types of RNA

Unit 4

11. Structure and functions of ribosome
12. Structure and functions of Endoplasmic reticulum
13. Structure and functions of Mitochondria

Unit 5

14. Structure and functions of Golgi.
15. Structure and functions of lysosomes and peroxisomes.
16. Methods in cell biology
 - (a) Elementary idea of principles and working of light, electron & fluorescence microscopy
 - (b) Elementary idea of cell culture

First Year T.D.C. Science, 2017-2018

Zoology

Paper- III (ZOOL113)

Developmental Biology

Unit 1

1. Aims and scope of developmental biology. Brief historical review and concept of Embryology.
2. Neuroendocrine regulation of reproductive organ in brief.
3. Gametogenesis: Spermatogenesis and structure of sperms, oogenesis and structure of ovum and types of ova

Unit 2

4. Fertilization: Main events of fertilization, Acrosome reaction, polyspermy, preventing mechanisms.
5. Errors in fertilization and significance of fertilization. Parthenogenesis (In brief)
6. In vitro fertilization and test tube baby
7. Embryo transplant

Unit 3

8. Cleavage: Planes and patterns and types of cleavage
9. Blastulation: types of blastulae
10. Gastrulation: Fate maps, Morphogenetic movement and their significance in gastrulation. Mechanisms and main characteristics of gastrulation.

Unit 4

11. Elementary knowledge of fate of three germ layers
12. Primary organizer and embryonic induction, concept of competence
13. Determination, differentiation, main characteristics of growth.
14. Regeneration

Unit 5

15. Extra embryonic membranes: development and functions.
16. Placentation: Definition, types, classification on the basis of morphology and histology. Functions of placenta.

First Year T.D.C. Science, 2017-2018
ZOOLOGY: PRACTICAL (ZOOL114)
ANNUAL SCHEME

1. General survey of museum specimens:

- a. Protozoa: *Entamoeba, Poystomella, Monocystis, Euglena, Noctiluca, Trypanosoma, Paramecium, Vorticella.*
- b. Porifera: *Scypha, Hyalonema, Euplectella, Spongilla and Euspongia*
- c. Coelenterata: *Physalia, Aurelia, Alcyonium, Corallium, Gorgonia, Pennatulla, Madrepora, Metridium*
- d. Platyhelminthes: *Dugesia, Fasciola, Taenia*
- e. Ashelminthes: *Ascaris(male and female, Wuchereria*
- f. Annelida: *Nereis, Heteronereis, Aphrodite, Arenicola, Chaetopterus, Hirudinaria*
- g. Arthropoda : *Limulus, Aranea, Palamnaeus, Lepas, Balanus, Apus, Sacculina, Eupagurus, Carcinus, Lepisma, Pediculus, Bombyx, Apis, Cimex, Julus, Scolopendra, Ixodes*
- h. Mollusca: *Mytilus, Chiton, Tereido, Turbinella, Doris, Aplysia, Dentalium, Nautilus, Sepia, Octopus, Loligo, Pecten, Solen, Pinctada*
- i. Echinodermata: *Asterias, Pentaceros, Antedon, Ophiothrix, Holothuria*
- j. Hemichordata: *Balanoglossus*

2. Study of permanent slides, sections passing through different regions of animals and developmental stages.

- a. Protozoa: *Plasmodium, Paramecium: binary fission and conjugation*
- b. Porifera: *L. S. and T. S. of Sycon, spicules, spongin fibres and gemmules*
- c. Coelenterata: *Obelia (colony and medusa), planula, scyphistoma and ephyra larvae of Aurelia*
- d. Platyhelminthes: *Miraidium, sporocyst, redia, and cercaria larvae of fasciola, scolex of taenia, hexacnath and cysticercus larvae of taenia.*
- e. Aschelminthes: *T.S. of Ascaris(male and female).*
- f. Annelida: *T.S. of neries and heteroneries. Trochophore larvae*

- g. *Arthropoda*: V.S. of compound, nauplius , zoea, megalopa and mysis Larvae
 - h. *Mollusa*: T. S. gill lamella, T.S. of shell of *Lamellidens* and Glochidium larvae
 - i. *Echinodermata*: T.S. of arm, tube feet and pedicellaria, bipinnaria larva of starfish, echinopluteus larva
 - j. *Hemichordata*: Tornaria larva
3. Digital animals: labeling and identification of various organs
- a. *Pheretima*: General anatomy, digestive, nervous, excretory and Reproductive system
 - b. *Palaemon*: Appendages, general anatomy, nervous and reproductive system
 - c. *Pila*: Organs of pallial complex, nervous system
4. Mounting: Permanent preparation of the following
- a. Protozoa: *Euglena, Paramecium*
 - b. Porifera: Sponge spicules, sponging fibres, gemmules
 - c. Coelenterata: *Obelia* (colony and medusa),
 - d. Platyhelminthes: Proglottid of *Taenia*
 - e. Annelida: Parapodia of *Nereis* and *Heteronereis*
 - f. Anthropoda: W.M. of Cyclops, Daphnia, mouth parts of 4 insects Culex, Anopheles male and female, housefly, cockroach and honey bee
 - g. Mollusca: Glochidium larva

Cell Biology

1. Prepared slides of mitochondria, Golgi bodies, centrosome, different stages of mitosis.
2. Buccal smear preparation for localization of mitochondria and golgi complex using vital stains
3. Preparation of Mitosis

Developmental Biology: Slides and specimen

1. W.M. of eggs, early cleavage stages, T.S. of blastula and gastrula of frog.
2. Study of chick embryo: 18 hours, 24 hours, 36 hours, 48 hours and 72 hours.
3. T.S. of ovary and testis.
4. Sperm smear to study the structure of sperm
5. Foetus and placenta.

REFERENCE BOOKS (LATEST EDITIONS):

1. Prasad, Beni: *Pila*, Lucknow Publishing House, Lucknow.
2. Bhatia, M. L.: *Hirudinaria*, Lucknow Publishing House, Lucknow.
3. De Robertis, E. D. P. and De Robertis, E. M. F.: *Cell and Molecular Biology*, Halt Saunder, Tokyo, Japan.
4. Gardner, E. J.: *Principles of Genetics*, John Wiley & Sons, New York.
5. Kotpal, R. L. :*Invertebrates*, Rastogi Publications, Meerut.
6. Nigam, H. C. : *A University Course in Invertebrate Zoology*, Vol. I, Mc Milan, London.
7. Prasad, S. N. :*Text Book of Invertebrate Zoology*, Kitab Mahal, Allahabad.
8. Patwardhan, S. S. :*Palaemon*, Lucknow Publishing House, Lucknow.
9. Reese, A. M. :*Outlines of Economic Zoology*, Blackiston Co., Philadelphia, U.S.A.
10. Vishwa Nath :*A Text Book of Zoology*, Vol. I, Invertebrate, S. Chand & Co., New Delhi.
11. Rastogi, Veerbala :*Invertebrate Zoology*, Kedar Nath Ram Nath, Delhi
12. Jordan, E. L. and P. S. Verma: *Invertebrate Zoology*, S. Chand & Co. Ltd., Ram Nagar, New Delhi.
13. Alberts, B. *et.al. The Cell* (Garland).
14. Lodish, H., *et.al. Molecular Cell Biology* (Freeman).
15. Gupta, P. K., *Genetics*, Rastogi Publications, Meerut.
16. Rastogi, Veer Bala, *Cell Biology*, Kedar Nath Ram Nath, Delhi.

BHUPAL NOBLE'S UNIVERSITY
B.Sc.-Three Year Degree Course
Second Year T.D.C. Science, 2017-2018
Zoology (Annual Scheme)

The second year TDC examination shall consist of three theory papers, each of three hours duration and a practical examination of five hours duration.

Paper-I: Life and diversity of animals- II (vertebrates)

Paper-II: Genetics and Biotechnology

paper-III: Applied zoology and Microbiology

Practical: Zoology

Pattern of question paper in the annual examination and distribution of marks:

Each theory paper in the annual examination shall have three sections i.e. A, B, and C. In section A, total 15 questions will be set in the paper, selecting at least three from each unit. Answer any 2 question from each unit in 50 words. These questions to be answered in a word or sentence. Each question carries 0.5mark, total 05 marks. Answer any 2 question form each unit.

In section B, there shall be total 10 questions, selecting two questions from each unit, five questions to be answered by the student selecting at least one from each unit. Answer should be given in approximately 250 words. Each question carries 04 marks, total 20 marks.

In section C, 05 descriptive type questions will be set in the examination paper from five units of the syllabus of the paper, selecting not more than one question from each unit. Each

question may have two sub divisions. Students are required to answer any two questions approximately in 300 words. Each question is of 5 marks, total 10 marks.

Bhupal Nobles` University, Udaipur
Faculty Of Science
Department Of Zoology
Scheme Of Studies
Bsc II Year (Annual Scheme)

S. No.	PAPER	NOMENCLATURE	COURSE CODE	UNIVERSITY EXAM	INTERNAL ASSISMENT	MAX. MARKS
1.	Paper I	Life & Diversity Of Animals (Vertebrates)	ZOOL 221	35	15	50
2.	Paper II	Applied Zoology And Microbiology	ZOOL 222	35	15	50
3.	Paper III	Genetics And Biotechnology	ZOOL 223	35	15	50
4.	Practical	Zoology	ZOOL 224	75	-	75

The marks distribution of internal assisment-

- 1. Mid Term Examination – 10 marks**
- 2. Attendance – 5 marks**

SECOND YEAR TDC SCIENCE, (2017-18)
ZOOLOGY
PAPER-I (ZOOL221)
LIFE AND DIVERSITY OF ANIMALS-II (VERTEBRATES)

UNIT-I

- 1 Characteristics and classification of Protochordates and Agnatha upto orders with examples.
- 2 Type study – *Herdmania*.
- 3 Affinities of *Amphioxus* and importance of *Ammocoete* larva.

UNIT-II

- 4 Characteristics and classification of Pisces (after Berg) and Amphibia upto orders with examples.
- 5 Types study – *Scoliodon*, Fish migration, Osmoregulation in Fishes and Parental care in Amphibia.

UNIT-III

- 6 Characteristics and classification Reptiles upto order with examples.
- 7 Type study- *Calotes*. Identification of Poisonous and non-Poisonous snakes, Biting mechanism in snakes, venom, antivenom, medicinal significance of venom.
- 8 *Sphenodon*: Characteristics and Affinities.

UNIT-IV

- 9 Characteristics and classification of Aves upto orders with examples.
- 10 Type study – *Columba*, flight adaptations, perching mechanism, types of feathers.
- 11 Bird migration.

UNIT-V

- 12 Characteristics and classification of Mammalia upto orders with examples.
- 13 Type study-*Rattus* (Digestive, respiratory and urinogenital systems only).
- 14 Dentition, hair and thermoregulation, integumentary derivatives.

SECOND YEAR TDC SCIENCE, 2017-18
ZOOLOGY
PAPER-II (ZOOL222)
GENETICS AND BIOTECHNOLOGY

UNIT-I

1. Brief history of genetics, Mendelian laws and their significance, Molecular basis of genetic information.
2. Genetic interaction : Incomplete dominance and Co-dominance, duplicate genes, epistasis, multiple-gene inheritance, ABO blood group, Rh factor.
3. Linkage and crossing over: Kinds of linkage –Complete and incomplete linkage, linkage groups, significance of linkage, mechanism of crossing over.

UNIT – II

4. Light and electron microscope structure of chromosome (from nucleosome to organization of chromatids. Morphological classification of chromosome.)
5. Extra- chromosomal inheritance.
6. Chromosomal theory of sex determination, hormonal theory of sex determination, X and Y chromosome, gynandromorphism.

UNIT-III

7. Genetic code; triplet, initiation and termination codons, palindromes.
8. Concepts of gene, muon, recon, cistron, gene expression, Lac- operon, trip-operon.
9. Genetic engineering: Restriction enzymes, cloning vehicle, C-DNA, applications of genetic engineering. Hybridoma technology.

UNIT-IV

10. Mutations: Definition, gene mutation, chromosomal mutation, chromosomal aberrations, somatic and germ mutation, numerical alterations of chromosomes, molecular basis of mutation mutagenic agents.
11. Polytene and lamp-brush chromosomes.
12. Eugenics and genetic counselling.

UNIT-V

13. Medicines and biotechnology: Microbes in medicine, antibiotics vaccines, enzymes and antigens.

14. Food and dairy microbiology: Fermented food production, dairy products, food preservation, microbial spoilage, alcoholic beverages and vinegar
15. Role of biotechnology in health care.

SECOND YEAR TDC SCIENCE, 2017-18
ZOOLOGY
PAPER-III (ZOOL223)
APPLIED ZOOLOGY AND MICROBIOLOGY

UNIT-I

1. Biotic Inter-relation – Parasitism, predation, commensalism, mutualism.
2. History, general account and scope of sericulture. Distribution of mulberry and non-mulberry silkworm.
3. Life history of *Bombyx mori*.
4. Brief idea of Rearing techniques and Reeling of silkyarn of silkworm.
5. Brief idea of diseases of silkworm.

UNIT-II

6. History , scope and general practices of pearl culture.
7. Rearing of pearl oyster:
 - (a) Indigenous methods of pearl culture.
 - (b) Modern methods of pearl culture.
8. Economic Importance of pearl and pearl culture.
9. Brief idea of diseases and enemies of pearl culture.

UNIT-III

10. Fish culture and fisheries:
 - (a) Culturable fresh water fishes of India.
 - (b) Inland, marine and estuarine fisheries.
 - (c) Preservation of fishes.
 - (d) Economic importance of fishing industry.

UNIT –IV

11. Concepts of basic microbiology and its significance, theory of spontaneous generation, gram theory of fermentation and disease, work of Louis Pasteur.
12. General account of classification, structural organization, physiology and multiplication of bacteria.
13. Brief idea of industrial, Medical and Environmental microbiology.

UNIT-V

14 DNA and RNA viruses.

15 AIDS and Swine flu: Causal agents, Transmission, Pathogenicity, Prevention and Laboratory diagnosis of infections and treatment.

SECOND YEAR TDC SCIENCE 2017-18 ZOOLOGY-PRACTICAL (ZOOL224) Annual Scheme

General survey of Vertebrates (Museum specimens)

- A Urochordata : *Ciona, Pyrosoma, Doliolum, Salpa.*
B Cephalochordata : *Amphioxus*
C Agnatha : *Petromyzon, Ammocoete larva*
D Pisces : *Echeneis, Sphyrna, Torpedo, Pristis, Labeo, Clarias, Anabas, Hippocampus (male & female), Chimaera, Anguilla, Protopterus*
E Amphibia : *Ichthyophis, Axolotl larva, Salamander, Bufo, Rana Hyla, Pipa, Amphiuma, Alytes.*
F Reptilia : *Testudo, Trionyx, Hemidactylus, Draco, Calotes, Chamaeleon, Varanus, Phrynosoma, Heloderma, Naja, Vipera, Typhlops, Bungarus, Hydrophis, Eryx, models of Dinosaurs.*
G Aves : *Columba, Psittacula, Passer, Bubo, model of Archaeopteryx.*
H Mammalia : *Pteropus, Erinaceus, Hystrix, Crocodylus, Manis.*

PREPARED SLIDES:

- 1 Cephalochordata : *Amphioxus*: T.S. through buccal region, T.S. through pharynx showing gonads, T.S. through caudal region.
- 2 Pisces : Placoid, cycloid and Ctenoid scales, V. S. of skin.
- 3 Amphibia : V. S. of skin, T.S. of testis, T.S. of kidney and T.S. of liver.
- 4 Reptilia : V. S. of skin and T.S. of stomach.
- 5 Aves : T.S. of intestine, T.S. of liver, T.S. of ovary, filoplume W.M.
- 6 Mammalia : T.S. of pancreas, T.S. of thyroid gland, L. S. of pituitary gland, T.S. of stomach, T.S. of intestine, L.S. of kidney, T.S. of testis and ovary and V. S. of skin, T.S. of lung.

PERMANENT PREPARATIONS : Unstained placoid scales, spicules of *Herdmania*.

DIGITAL ANIMALS : Labelling & identification of various organ & systems.

Herdmania : Neural complex.

Scoliodon : Alimentary canal scroll valve in situ, afferent and efferent branchial arteries, eye muscles, internal ear, Arterial, venous and urino-genital system.

OSTEOLOGY :

Identification of disarticulated skeleton of *Rana*, *Varanus*, *Fowl* and *Oryctolagus*.

GENETICS :

Drosophila : Life cycle and its culture.

APPLIED ZOOLOGY :

1. Identification of different stages (from egg to adult) of silkworm.
2. Mounting of mouth parts and sting apparatus of honey bee.
3. Identification of cultivable varieties of shell fish and fin fish.
4. Gram staining of microbes.

REFERENCE BOOKS(LATEST EDITIONS) :

LIFE AND DIVERSITY OF ANIMALS(VERTEBRATES)

- 1 Ayyar, E.K. and T.N. Ananthakrishnan, Manual of Zoology, vol.II(Chordata), S. Viswanathan (Printers and Publishers) Pvt. Ltd. Madras.
- 2 Jordan, E.L. and P.S. Verma, Chordate Zoology and Elements of Animal Physiology, S.Chand & Co.Ltd., Ram Nagar, New Delhi (English and Hindi Editions).
- 3 Parker and Haswell, Text Book of Zoology, Vol-II (Chordata), A.Z.T.B.S. Publishers and Distributors, New Delhi-110051.
- 4 Waterman, Allyn J, et.al., Chordate Structure and Function, Mac Millan and Co., New York.
- 5 Kotpal, R.L., Modern Text Book of Zoology-Vertebrates, Rastogi Publications, Meerut (English and Hindi Editions).
- 6 Ganguly, BB, Sinha, AK and Adhikari, S :Biology of Animals, Vol.II,

New Central Book Agency(p) Ltd. Kolkata.

- 7 Alexander, R.M. : The Chordates (Cambridge University Press).
- 8 Monieth, A.R.: The Chordates(Cambridge University Press).
- 9 Young, J.Z. : Life of Vertebrates(Oxford University
- 10 Waterman, A.J:Chordata- Structure and function (Macmillan Co.).

GENETIC AND BIOTECHNOLOGY

- 11 Verma, P.s. and V.K.Agarwal, Genetics, S.Chand & Co.
- 12 Lewis, C.D. and Lewin, R., Biology of gene, McGraw Hill, Toppan Co. Ltd.
- 13 Gunther S.Stent, Molecular Genetics, macmillan Publishing Co. Inc.
- 14 Goodenough, V., Genetics, New York Holt, Rinchart and Winston.
- 15 Gardner, Principles of Genetics, Wiley Eastern Pvt., Ltd.
- 16 Winchester, Genetics, Oxfords IBH Publications
- 17 Stickberger, Genetics, MacMillan Publications.
- 18 Pai, A.C., FOUNDations of Genetics, McGrew Hill Publications.
- 19 R.A.Meyers (Endocrinology.): Molecular Biology and Biotechnology, VCH Publishers.
- 20 Glick : Molecular Biotechnology.
- 21 R.W.Old and S.B. Primrose: Principles of Gene Manipulation and Introduction to Genetic Engineering.

22 Gupta PK : Elements of Biotechnology, Rastogi Publicationa, Meerut.

APPLIED ZOOLOGY AND MICROBIOLOGY :

23 Jhingran, VG, Fish and Fisheries of India. Hindustan Publishing Corporation, New Delhi.

24 Kovaleve, PA, Silkworm Breeding Stocks, Central Silk Board, Merine Drive, Bombay.

25 Roger, A.Morse, the ABC and XYZ of Bee Culture, A.I. Root and Co., Medina, Ohio44256.

26 Metcalf CL and WP Flint. Destructive and Useful Insects, Tata McGraw Hill publishing Co. Ltd., New Delhi- 110051

27 Sharma PD, Microbiology, Rastogi Publications Meerut.

28 Shukla and Upadhyaya : Economic zoology (Rastogi Publishers)

29 Venkitaraman : Economic Zoology (Sudarshana Publishers)

PRACTICAL:

30 Verma, PS, A Manual of practical Zoology Vertebrates S. Chand and Co. Ltd., Ram Nagar, New Delhi (English and Hindi Editions).

31 Lal, SS : Practical Zoology Vertebrates, Rastogi Publication, Meerut (English and Hindi Editions).

BHUPAL NOBLE'S UNIVERSITY
B.Sc.-Three Year Degree Course
Third Year T.D.C. Science, 2017-2018
Zoology (ANNUAL SCHEME)

The third year TDC examination shall consist of three theory papers, each of three hours duration and a practical examination of five hours duration.

Paper-I: Animal Physiology, Biochemistry and Immunology

Paper-II: Ecology and Biostatistics

Paper-III: Ethology and Evolution

Zoology Practical

Pattern of question paper in the annual examination and distribution of marks:

Each theory paper in the annual examination shall have three sections i.e. A, B, and C. In section A, total 15 questions will be set in the paper, selecting at least three from each unit. Answer any 2 question from each unit in 50 words. These questions to be answered in a word or sentence. Each question carries 0.5mark, total 05 marks. Answer any 2 question form each unit.

In section B, there shall be total 10 questions, selecting two questions from each unit, five questions to be answered by the student selecting at least one from each unit. Answer should be given in approximately 250 words. Each question carries 04 marks, total 20 marks.

In section C, 05 descriptive type questions will be set in the examination paper from five units of the syllabus of the paper, selecting not more than one question from each unit. Each

question may have two sub divisions. Students are required to answer any two questions approximately in 300 words. Each question is of 5 marks, total 10 marks.

Bhupal Nobles` University, Udaipur
Faculty Of Science
Department Of Zoology
Scheme Of Studies
Bsc III Year (Annual Scheme)

S. No.	PAPER	NOMENCLATURE	COURSE CODE	UNIVERSITY EXAM	INTERNAL ASSISMENT	MAX. MARKS
1.	Paper I	Animal Physiology, Biochemistry And Immunology	ZOOL 331	35	15	50
2.	Paper II	Ecology And Statistics	ZOOL 332	35	15	50
3.	Paper III	Ethology And Evolution	ZOOL 333	35	15	50
4.	Practical	Zoology	ZOOL334	75	-	75

The marks distribution of internal assisment-

- 1. Mid Term Examination – 10 marks**
- 2. Attendance – 5 marks**

THIRD YEAR T.D.C. SCIENCE, 2017-18
ZOOLOGY
PAPER-I (ZOOL331)
ANIMAL PHYSIOLOGY, BIOCHEMISTRY AND IMMUNOLOGY

UNIT-I

1. Light microscopic structure and functions of gastrointestinal tract, liver and pancreas.
2. Digestion and absorption of food in alimentary canal.
3. Metabolism of carbohydrates: Glycolysis, decarboxylation of pyruvic acid, Krebs' cycle, electron transport system and oxidative phosphorylation; Glycogenesis and glycogenolysis.

UNIT-II

4. Metabolism of Proteins: Transamination, deamination and Urea cycle
5. Metabolism of lipids: Biosynthesis of saturated fatty acids and B-oxidative pathways of fatty acids; formation of ketone bodies.
6. Light microscopic structure and functions of Lungs,
Respiration: Mechanism of respiration, vital capacity of lungs, transport of gases, dissociation curve of oxyhaemoglobin and control of respiration, chloride shift.

UNIT-III

7. Blood: Structure and function of blood cells, ABO blood groups and Rh factor, mechanism of blood clotting.
8. Ultrastructure of cardiac and skeletal muscles .Physiology of muscle contraction.
9. Light microscopic structure and functions of Kidneys.
Excretion: Structure and function of nephron, control of renal function.

UNIT-IV

10. Nerve Physiology: Ultrastructure of neuron, synapse, conduction of nerve impulse and neuromuscular junctions.
11. Light microscopic structure and functions of testis and ovary.
Reproductive Physiology: Hormonal control of testicular and ovarian function with reference to estrous and menstrual cycle.
12. Light microscopic structure, functions and disorders of endocrine glands - pituitary,

pancreas, adrenal, thyroid and parathyroid.

UNIT-V

13. Immunology: Definition, types of immunity, innate and acquired, humoral and cell-Mediated.
14. Cells of immunity: macrophages, lymphocytes (B and T types), T-helper cells, T-killer cells, plasma cells and memory cells.
15. Antibody: definition, structure and functions of each class of immunoglobulins.
16. Antigen: antigenicity of molecules, haptens. Antigen - antibody reactions, precipitation reaction, agglutination reaction, neutralizing reaction and phagocytosis.

B. N. UNIVERSITY, UDAIPUR
THIRD YEAR T.D.C. SCIENCE, 2017-18
ZOOLOGY
PAPER-II (ZOOL332)
ECOLOGY AND BIostatISTICS

UNIT-I

1. Terminology and scope of Ecology
2. Habitat and niche
3. Ecosystem: Components of ecosystem, energy flow and nutrient cycles, food chain, food web and ecological pyramids.
4. General idea of population and community ecology

UNIT-II

5. Freshwater environment: Physico-chemical features and biotic communities, productivity and eutrophication.
6. Marine environment: Characteristics, zonation, fauna and their adaptation, deep sea and estuarine fauna.
7. Terrestrial environment: General characteristics of desert, grass land and forest ecosystems.

UNIT-III

8. Environmental pollution: Biodegradable and non-biodegradable pollutants.
9. Air Pollution: Source, nature, prevention and control, green house effect, ozone depletion and global warming.
10. Water pollution: Source, nature and abatement.
11. General account of noise pollution and radioactive pollution.

UNIT-IV

12. Conservation of natural resources: Wild life management, brief idea of national parks and wildlife sanctuaries of India. Threatened and endangered species of India.
13. Environmental planning and environmental impact assessment.
14. Brief account of environmental Acts and Legislations (enacted after 1970)

UNIT-V

15. Concepts and applications of Biostatistics.
16. Frequency distribution, graphical presentation, mean, mode, median, standard deviation and standard error.
17. Correlation, T-test, Chi-square test.
18. Shanon and Weinner diversity index.

B. N. UNIVERSITY, UDAIPUR
THIRD YEAR T.D.C. SCIENCE, 2017-18
ZOOLOGY
PAPER-III (ZOO333)
ETHOLOGY AND EVOLUTION

UNIT-I

1. Introduction and history of Ethology.
2. Methods of studying behaviour.
3. Neuroanatomical, neurophysiological, neurochemical, focal and scan sampling techniques.
4. Human Ethology, general aspects.
5. Orientation taxes and kinesis
6. Brief idea of learning.

UNIT-II

7. Social organization with reference to dominance, hierarchy, social competition and territoriality.
8. Reproductive behaviour with reference to courtship, mating, parental investment and stickle back fish (sexual dimorphism).
9. Elementary idea of role of pheromones and hormones in insects and vertebrates in relation to behaviour.

UNIT-III

10. Origin of life
11. History of evolutionary thought, Lamarckism and Neo-Lamarckism
12. Darwinism and Neo-Darwinism
13. Evidences of organic evolution.
14. Concept of micro and megaevolution.

UNIT-IV

15. Variation: Kinds and sources, role in evolution.
16. Isolation and speciation, definition, isolating mechanism, origin of species and processes of speciation.
17. Adaptation: Definition, kinds of adaptations, adaptive radiation, convergence and divergence.

18. Geological time scale.

UNIT-V

19. Brief account of zoogeographical regions of world.

20. Fossils and their evolutionary significance.

21. Phylogeny of horse.

22. Evolution of man.

THIRD YEAR T.D.C. SCIENCE ZOOLOGY-PRACTICAL (ZOOL334)

I. ETHOLOGY AND EVOLUTION :

1. Study of homology and analogy from suitable specimens/ pictures.
2. Study of Darwin's Finches with diagrams / cutouts.
3. Antennal grooming behaviour of cockroach.
4. Visit to a zoo/natural habitat of wild animals.
5. Demonstration of social behaviour of honey bee colony.
6. Adaptive modifications in the feet of birds.
7. Adaptive modification in the beak of birds.
8. Adaptive modification in the mouth parts of insects.

II. BIOCHEMICAL, PHYSIOLOGICAL AND ECOLOGICAL EXERCISES :

1. Various biochemical tests of
 - a) Proteins
 - b) Carbohydrates
 - c) Lipids
2. RBC and WBC counts.
3. Estimation of haemoglobin.
4. Blood groups (ABO and Rh).
5. Measurement of blood-pressure.
6. Abnormal values of constituents of urine.
7. Water analysis: pH, alkalinity, chloride and transparency.
8. Soil analysis : texture, moisture, organic and inorganic contents.

III. DIGITAL ANIMALS: LABELLING & IDENTIFICATION OF VARIOUS ORGANS

Scoliodon : Cranial nerves and brain.

IV. MUSEUM SPECIMENS/SLIDES SHOWING ADAPTATIONS :

Students are required to write about specific adaptations of following animals in relation to habit and habitat only:

1. Cursorial : *Acinonyx jubatus, Equus caballus, Moschus moschiferous.*
2. Flight: *Columba livia, Pteropus, Draco,*
Exocoetus, Papilio.
3. Arboreal: *Chamaeleon, Hyla, Presbytis.*
4. Aquatic: *Physalia, Chiton, Hydrophis, Labeo, Anguilla, Notopterus*
5. Fossorial: *Pheretima, Teredo, Chaetopterus, Talpa, Lepus, Ichthyophis,*
Naja.
6. Parasitic: *Taenia, Fasciola, Enterobius, Ascaris, Schistosoma,*
Hirudinaria, Pediculus, Ixodes.

REFERENCE BOOKS (LATEST EDITIONS) :

I. ANIMAL PHYSIOLOGY

1. William S. Hoar, General and Comparative Physiology, Prentice Hall of India Pvt. Ltd.
2. Wood, D.W., Principles of Animal Physiology.
3. Prosser CL., Comparative Animal Physiology, Satish Book Enterprise.
4. Eckert, Animal Physiology. (W.H. Freeman).
5. Ganong : Review of Medical Physiology (Lange).

II. BIOCHEMISTRY

1. Stryer, L : Biochemistry (Freeman)
2. Conn et al : Outlines of Biochemistry (Wiley)
3. R.K. Murray et al, Harpers Biochemistry, Lang Medical Book.

III. IMMUNOLOGY

1. Roitt I: Essential Immunology (ELBS)
2. Kuby : Immunology (W.H. Freeman).

IV. ECOLOGY

1. Odum, E.P. : Ecology (Amerind).
2. Odum, E.P. : Fundamentals of Ecology (Saunders).
3. Ricklefy : Ecology (W.H. Freeman).

V. BIOSTATISTICS

1. Green, R.H. Sampling design and statistical methods for environmental biologists. John Wiley and Sons New York.
2. Snedecor, G.W. and W.G. Cochran. Statistical methods. Affiliated East- West Press, New Delhi (Indian Ed.)
3. P.N. Arora and P.K. Malhan. Biostatitics, Himalaya Publishing House, Bombay

VI. ETHOLOGY

1. Drickamer & Vessey: Animal Behaviour, Concepts, Processes and Methods (Wadsworth).
2. Grier : Biology of Animal Behaviour (Mosby College)

3. Immelmann : Introduction to Ethology (Plenum Press)
4. Lorenz : The Foundation of Ethology (Springer-Verlag)
5. Manning : An Introduction to Animal Behaviour (Addison-Wesley)
6. Reena Mathur : Animal Behaviour, Rastogi Publications, Merrut.

VII. EVOLUTION

1. Dobzhansky, Ayala, Stebbins & Valentine : Evolution (WH Freeman).
2. Dobzhansky : Genetics and Origin of species (Columbia University Press)
3. Major : Population, Species and Evolution
4. White : Animal Cytology and Evolution.
5. Moody : Introduction to Evolution
6. Savage : Evolution (Holt, Reinhart and Winston).

VIII. PRACTICAL

1. Verma, PS, A manual of practical Zoology Vertebrates S.Chand and Co. Ltd., Ram Nagar, New Delhi(English and Hindi Editions).
2. Lal, SS : Practical Zoology Vertebrates, Rastogi Publication, Meerut(English and Hindi Editions).
3. Verma PS & Srivastava PC, Advanced Practical Zoology, S.Chand & Co.

Bhupal Nobles` University, Udaipur
Faculty Of Science
Environmental Studies (ENVS 111)
Scheme Of Studies
I Year (Semester Scheme)
(FOR BBA & BHM)

S. No.	PAPER	NOMENCLATURE	COURSE CODE	UNIVERSITY EXAM	INTERNAL ASSISMENT	MAX. MARKS
1.	Paper	Environmental Studies	ENVS 111	70	30	100

The marks distribution of internal assisment-

- 1. Mid Term Examination – 15 marks**
- 2. Attendance + Assignemt – 15 marks**

Ability Enhancement Compulsory Course (AECC – Environmental Studies)

SEMSTER SCHEME (ENVS 111)

Unit-1:

- The multidisciplinary nature of environmental studies
- scope and importance; concept of sustainability and sustainable development.
- What is an ecosystem? Structure and function of an ecosystem; Energy flow in the ecosystem; Ecological succession. - Food chains, food webs.
- Case studies of the following ecosystems. –
- Forest ecosystem.
- Desert ecosystem.
- Aquatic ecosystems (ponds, streams, lakes, rivers).

(8 lecture)

Unit- 2

- . Land resources and Land use change; Land degradation; Soil erosion & desertification.
- Deforestation: cause and impact due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: use and over exploitation of surface and ground water, Floods , Drought ,Conflicts over water (international & inter- state).
- Energy resources: Renewable and non-renewable energy resources. - Use of alternate energy resources, Growing energy needs, case studies.

(8 lectures)

Unit 3

- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zone of India; Biodiversity patterns and global biodiversity hot spots.
- India as a mega-diversity nation; Endangered and endemic species of India.
- Threats to biodiversity - habitat loss poaching of wild life, man-wild life conflicts, biological invasions; Conservation of biodiversity – In situ and Ex-situ conservation of biodiversity.

(8 lectures)

Unit-4:

- Environmental Pollution: types, causes, effect and control; Air pollution, Water pollution, Soil pollution.
- Solid waste management: control measures of urban industrial wastes.

(7 lectures)

- Climate change, global warming, ozone layer depletion, acid rain, and impacts on human communities and agriculture.
- Environmental laws: Environmental protection Act. i Air (prevention and control of pollution) Act; water (prevention and control of pollution) Act; Wild life protection Act. Forest conservation Act, International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal population and rights, and human wildlife conflicts in Rajasthan context.

(8 lectures)

Unit 5

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movement; Chipko, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.

(6 lectures)

- Visit to an area to document environmental assets : river/forest/flora/ fauna, etc
- Visit to local polluted site- Urban/rural/industrial/agricultural.
- Study of common plants, insects and Birds and basic principles of identification.
- Study of simple ecosystem-Pond, river.

(Equal to 5 lectures)

Bhupal Nobles` University, Udaipur
Faculty Of Science
Environmental Studies
Scheme Of Studies
I Year (Annual Scheme) (ENVS 111)
(FOR B.Sc., B.Com., B.A. & BCA)

S. No.	PAPER	NOMENCLATURE	COURSE CODE	UNIVERSITY EXAM	INTERNAL ASSISMENT	MAX. MARKS
1.	Paper	Environmental Studies	ENVS 111	70	30	100

The marks distribution of internal assisment-

- 1. Mid Term Examination – 15 marks**
- 2. Attendance + Assignemt – 15 marks**

SYLLABUS FOR ENVIRONMENTAL STUDIES (ENVS 111) (ANNUAL SCHEME)

The syllables and scheme of examination is as under: Compulsory in 1st year for all streams at undergraduate level

Unit-1:

The multidisciplinary nature of environmental studies and Natural Resources – Definition, scope and awareness, Need for public awareness.

Renewable and non-renewable resources, Natural resources and associated problems.

1. Forest resources - Use and over-exploitation, Deforestation, Timber exploitation, Mining - Dams and their effects on forests and tribal people.

2. Water resources. - Use and over utilization of surface and ground water, Floods , Drought ,Conflicts over water, Dams benefits and problems.

3. Mineral resources. - Use and exploitation, Environmental effects of extracting and using mineral resources.

4. Food resources- World food problems, Changes caused by agriculture and overgrazing, Effects of modern agriculture, Fertilizer, pesticide problems, Water logging, Salinity.

5. Energy resources: - Growing energy needs. - Renewable and non-renewable energy resources. - Use of alternate energy resources.

6. Land resources: - Land as a resource. - Land degradation. - Man induced landslides. - Soil erosion & desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable system.

Unit-2:

Ecosystem: - Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem. - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction types, characteristic features, structure and function of the following ecosystems. - Forest ecosystem. - Grassland ecosystem - Desert ecosystem. - Aquatic ecosystems (ponds, streams, lakes, rivers, oceansestuaries).

Unit-3:

Biodiversity and its conservation: - Introduction, definition and diversity at genetic, species and ecosystem level. - Biogeographically classification of India. - Value of biodiversity, consumptive use productive use, social, ethical, aesthetic and option values. - Biodiversity at global, national & local levels. - India as a mega-diversity nation. - Hot-spots of biodiversity. - Threats to biodiversity - habitat loss poaching of wild life, man-wild life conflicts. - Endangered and endemic species of India. - Conservation of biodiversity – In situ and Ex-situ conservation of biodiversity.

Unit-4:

Environmental Pollution: - Definition, causes, effect and control measures of - Air pollution. - Water pollution - Soil pollution. - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards. - Solid waste management: Causes, effects and control measures of urban industrial wastes. - Role of an individual in prevention of pollution. - Disaster management: Flood, earthquake, cyclone and landslides.

Unit-5:

Social issues, Human Population and the Environment: - From unsustainable to sustainable development - Urban problems related to energy. - Water conservation, rain water harvesting, water shed management. - Settlement and rehabilitation of people, its problem of concerns. - Environmental ethics-issues and possible solutions. Ozone layer depletion, nuclear accidents. - Wasteland reclamation. Consumerism and waste products. - Environmental protection Act. i. Air () prevention and control of pollution Act
ii. Wild life protection Act iii. Forest conservation Act. - Issues involved in enforcement of environmental legislation. - Public awareness.

Population growth, variation among nations. - Population explosion-Family welfare programme. – Environment and Human health. - Human rights.
Value education. - HIV/AIDS - Women & child welfare. - Role of information technology in environment and human health.

Field Work - Visit to a local area to document environmental assets-river/forest/ grassland/ hill/ mountain. - Visit to local polluted site- Urban/rural/industrial/agricultural. - Study of common plants, insects and Birds. - Study of simple ecosystem-Pond, river, hill slope etc.

