

# **TRIPURA UNIVERSITY**

**(A Central University)  
Suryamaninagar**

**SYLLABUS**

**OF**

**Zoology  
(General & Major)**

**Semester-I**



TRIPURA UNIVERSITY

**Year 2014**

# TRIPURA UNIVERSITY

## Zoology (General)

### Course Structure

Year	Semester	Paper	Content	Marks
1 <sup>st</sup> Year	Semester I	Paper -1	U-I. Non Chordates I (Without Coelom) U-II. Non Chordates II (With Coelom) U-III. Chordates I (Protochordates to fish) U-IV. Chordates II (Amphibia to mammals)	100
	Semester II	Paper-2A	U-I. Cell Biology, Histology and Developmental Biology U-II. Biochemistry, Animal Physiology and Endocrinology	50
		Paper - 2B	Practical based on theory of Paper II-A	50
2 <sup>nd</sup> Year	Semester - III	Paper-3A	U-I. Taxonomy & Classification, Evolution & Adaptation U-II. Ecology, Ethology, Zoogeography and Biodiversity	50
		Paper-3B	Practical based on theory of Paper -III-A	50
	Semester-IV	Paper - 4A	U-I. Applied Zoology U-II. Genetics and Molecular Biology	50
		Paper - 4B	Practical Based on Theory of Paper -IV-A	50
3 <sup>rd</sup> Year	Semester- V	Paper-5A	U-I. Parasitology and Medical Entomology U-II. Microbiology and immunology	50
		Paper-5B	Practical Based on Theory of Paper-V-A	50
	Semester-VI	Paper - 6	Project in Zoology  i. Project Preparation (literature review, field work/lab work) - 50 ii. Presentation - 25 iii. Viva - 25	100

# TRIPURA UNIVERSITY

## Zoology (General)

### Semester I

#### Paper - I

##### Unit -I: Non-Chordates -I (without coelom)

- Paramecium sp.: Structure, locomotor organelle and reproduction.
- Sycon: Histology of body wall with special reference to canal system and spicules.
- Obelia: Organisation and Life history with special reference to metagenesis.
- Morphology and functional anatomy of *Planaria* & *Fasciola*

##### UNIT II : Non-Chordates - II (with coelom)

- Mechanism of feeding and structure of digestive system in Earthworm and Pila.
- Respiration : Structure and function of : Gills (Prawn). Trachea (Cockroach), Ctenidium and Pulmonary sac (Pila).
- Circulation: Open type (Cockroach) and closed type (Earthworm).
- Excretion : Nephridia and its role in Earthworm
- Nervous System: Basic plan of Invertebrates nervous system; Nervous system in Cockroach and Pila.

##### UNIT III: Chordata - I (Protochordates to Pisces)

- Branchiostomata: General Organisation, structure of Pharynx & Nephridia, mechanism of feeding and excretion.
- Ascidia: Structure of Pharynx and mechanism to feeding; The life history with special reference to retrogressive metamorphosis, Evolutionary significance of Ascidian Tadpole.
- Cyclostomata: Petromyzon: Difference between Petromyzon and Myxine; Respiratory system of Petromyzon; Ammocoetes larva and its significance.
- Lates: Digestive, Respiratory, Circulatory and Urinogenital system.
- Accessory Respiratory organs in fishes.

##### UNIT IV: Chordata -II (Amphibia to Mammals)

- Digestive system: Functional anatomy of stomach in Collumba and Cow.
- Respiratory System: Lungs and mode of respiration in Amphibia, Birds and Mammals.
- Circulatory system: Comparative anatomy of Heart and aortic arches in Amphibia, Reptiles, Birds and Mammals.
- Nervous system: Structure of Brain in Toad and Guinea pig; Cranial Nerves-Origin, distribution and function; Difference between Sympathetic and Para- Sympathetic Nervous system.
- Difference between poisonous and non-poisonous snakes
- Exoskeletal structure in birds and mammals

# TRIPURA UNIVERSITY

## Zoology (Major)

### Course Structure

-Year	Semester	Paper	Content	Marks
1 <sup>st</sup> Year	Semester I	Paper -1	U-I. Non Chordates I (Without Coelom) U-II. Non Chordates II (With Coelom) U-III. Chordates (Protochordates to mammals) U-IV. Taxonomy and Classification	100
	Semester II	Paper-2A	U-I. Cell Biology, Histology and Developmental Biology U-II. Applied Zoology	60
		Paper -2B	Practical based on theory of Paper II-A	40
2 <sup>nd</sup> Year	Semester - III	Paper-3A	U-I. Genetics U-II. Ecology	60
		Paper-3B	Practical based on theory of Paper -III-A	40
	Semester-IV	Paper – 4A	U-I. Microbiology, Parasitology & Immunology U-II. Tools and Techniques in Biology	60
		Paper – 4B	Practical Based on Theory of Paper –IV-A	40
3 <sup>rd</sup> Year	Semester- V	Paper-5A	U-I. Adaptation, Zoogeography and Ethology U-II. Comparative Animal Physiology U-III. Biodiversity and Conservation U-IV. Biostatistics	100
		Paper-5B	Practical Based on Theory of Paper-V-A	100
	Semester-VI	Paper – 6A	U-I. Evolutionary Biology U-II. Biochemistry U-III. Endocrinology and Reproductive Biology U-IV. Molecular Biology and Genetic Engineering	100
		Paper – 6B	Practical based on Theory of Paper VI-A	100

# TRIPURA UNIVERSITY

## Zoology (Major)

### Semester I

#### Paper - I

##### Unit-I: Non-chordates-I (without Coelom):

- **Protozoa:** Locomotion in protozoa [*Amoeboid (Amoeba)*, Cilliary (*Paramecium*), Flagellar (*Euglena*); Morphology and reproduction in *Paramecium* .
- **Porifera:** *Sycon*- skeletal and canal system.
- **Cnidaria:** Polymorphism in *Siphonophora*; Coral and Coral reef formation
- **Helminthes:** Excretory and Nervous system in *Helminthes*.

##### Unit -II: Non-Chordates-II (With Coelom)

- Coelom: origin, types and function
- Nature, origin and significance of metamerism
- Morphology, Digestive and excretory system of leech
- Morphology, digestive, respiratory, excretory and reproductive system of cockroach
- Morphology, digestive, respiratory and nervous system of *Pila*
- Morphology and water vascular system of *Asterias*
- Echinoderm larvae and their evolutionary significance

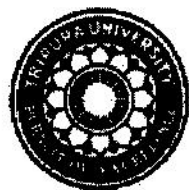
##### Unit-III: Chordates (Protochordate to Mammals):

- **Protochordata:** Structural organization, ciliary mode of feeding and excretion in *Branchiostoma*; Life history of *Ascidia* & evolutionary significance of Ascidian tadpole; Affinities & evolutionary position of *Balanoglossus*.
- **Cyclostomata:** Comparative Study of *Petromyzon* & *Myxine*; Amocoetes larva and evolutionary significance.
- **Pisces:** Difference between osteichthyes and chondrichthyes; *Labeo*: Morphology, Respiratory & Reproductive system; Scales and fins in fishes; Accessory respiratory organs; General characters, distribution, affinities and evolutionary significance of Dipnoi.
- **Amphibia** -Neoteny and Pedomorphosis
- Comparative anatomy of heart and aortic arches in vertebrates
- Poisonous and Non-Poisonous Snake (Comparative account), Poison apparatus, mechanism of feeding and biting in snakes
- Functional anatomy of lungs in Birds and Mammals
- Specialization of digestive system in ruminant and non-ruminant mammals
- Integuments and its derivatives in birds and mammals

##### Unit -IV: Taxonomy and Classification

- Taxonomy, its history and relationship with systematics
- **Definition:** Classification, Phenon, Taxon, Category, Binomial and trinomial classification with examples, Rules of Zoological nomenclature
- **Kinds of Zoological Classification:** Components of Classification, Linnaean hierarchy
- **Concept of Species:** Typological, Nominalistic, Biological and Evolutionary

- **General Characteristics and Classification up to sub class: a) Porifera, Annelida, Arthropoda, Mollusca and Echinodermata and Order in b) Pisces, Amphibia, Reptilia and Mammalia**
- **Basic Concept of Six Kingdom Classification**



# **TRIPURA UNIVERSITY**

**(A Central University)  
Suryamaninagar-799022**

**Syllabus**

**For**

**Semester – II**

**Zoology (Major & General)**

**Year 2014**

Department of Zoology  
 Tripura University (A Central University)  
 B. Sc Zoology (Honours)  
 Proposed Syllabus (Under semester system) 2014

Year	Semester	Paper	Content	Marks
1 <sup>st</sup> Year	Semester I	Paper -I	U-I. Non Chordates I (Without Coelom) U-II. Non Chordates II (With Coelom) U-III. Chordates (Protochordates to mammals) U-IV. Taxonomy and Classification	100
	Semester II	Paper-2A	U-I. Cell Biology, Histology and Developmental Biology U-II. Applied Zoology	60
		Paper -2B	Practical based on theory of Paper II-A	40
2 <sup>nd</sup> Year	Semester - III	Paper-3A	U-I. Genetics U-II. Ecology	60
		Paper-3B	Practical based on theory of Paper -III-A	40
	Semester-IV	Paper -- 4A	U-I. Microbiology, Parasitology & Immunology U-II. Tools and Techniques in Biology	60
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3 <sup>rd</sup> Year	Semester- V	Paper-5A	U-I. Adaptation, Zoogeography and Ethology U-II. Comparative Animal Physiology U-III. Biodiversity and Conservation U-IV. Biostatistics	100
		Paper-5B	Practical Based on Theory of Paper-V-A	100
	Semester-VI	Paper -- 6A	U-I. Evolutionary Biology U-II. Biochemistry U-III. Endocrinology and Reproductive Biology U-IV. Molecular Biology and Genetic Engineering	100
		Paper -- 6B	Practical based on Theory of Paper VI-A	100



## Semester – II

### Paper 2A

#### Unit –I: Cell Biology, Histology and Developmental Biology

- Concept of Prokaryotic & Eukaryotic cells.
- Ultrastructure and functions of plasma membrane, mitochondria, Golgi complex, Endoplasmic Reticulum, ribosome, centrioles & lysosomes.
- **Chromatin:** Organization of euchromatin & heterochromatin; **Chromosome:** Morphology, primary & secondary constrictions, satellite bodies; classification on the basis of position of centromere, Polytene chromosome & Lampbrush chromosome.
- Nucleosome model of chromosome ultrastructure.
- **Cell cycle:** Phases & regulation, Mitosis, Meiosis, Synaptonemal complex.
- **Cancer:** Characteristics of cancer cells, classification according to tissue types; common carcinogens.
- Outline classification of animal tissue & their distribution, histology of skeletal muscle.
- Histology & functions of skin, liver, kidney & spleen in mammals.
- Gametogenesis, ultrastructure of sperm and ovum
- Physicochemical events in fertilization
- Eggs types, cleavage and fate maps
- Gastrulation in chick upto formation of three germinal layers
- Extraembryonic membrane in chick- formation and function
- Placenta : types, formation (rabbit) and function

#### Unit-II: Applied Zoology

- **Pisciculture:** Indian major carps, Exotic carps, composite fish culture- Principles & methods: Advantages & Disadvantages, Common fish diseases and their control.
- **Prawn culture:** Indian prawns of commercial value- Penaeid & Non-Penaeid group; Fresh & Brackish water Prawn culture.
- **Poultry:** Types of breeds, rearing and deep litter system- Advantages and disadvantages: Poultry Diseases & their control.
- **Apiculture:** Species of honey bee in India, social organization and life history of *Apis indica*, Modern methods of Apiculture, Bee products and their uses
- **Sericulture:** Species of Silkworm, Host plants and silk varieties in India, Life history and rearing of Mulberry silkworm, harvesting and processing of cocoon, reeling and extraction of silk; diseases of *Bombyx mori* and control measures
- **Vermiculture:** a) vermicomposting species [*Pteronyx excavatus* (Indian), *Eudrilus eugeniae* (South African), *Eisenia fetida* & *Eisenia andrei* (European)] and their selective features, b) Principle, methods and importance of vermicomposting
- **Pollinators and Pest:** a) Types of pollinators and pollination, importance of pollinators b) Definition of term pest, types of pest, importance of pest control, biological control of pest, pesticides and their hazards, integrated pest management, c) pest complexes of paddy, stored grains and brinjal; biology nature of damage and control of *Scirpophaga incertulus*, *Scitophilus oryzae* and *Leucinodes orbonalis*.

# TRIPURA UNIVERSITY

SYLLABUS OF ZOOLOGY, 2014

2<sup>nd</sup> Semester

## PAPER – II B

MAJOR

Total Marks = 50

1. Identification with reasons ( Any 4 )

4x4 =16

Group –A : Amoeba, Sycon, Obelia, Taenia, Ascaris, Leech, Perionyx excavatus (dung earthworm), Horse shoe crab, Macrobrachium rosenbergii, Pila, Starfish

Group – B : Branchiostoma, Ascidia, Petromyzon, Scoliodon, Sea Horse, Ichthyophis, Axolotl larva, Naja, Pigeon, Chiroptera.

2. A. Identification of Mammalian T.S. of : Skin, Spleen, small intestine, Liver, Pancreas, Kidney, Thyroid, Testes, Ovary ( any one)

B. Chick Embryo : 24 hrs, 48 hrs, 72 hrs ( any one )

C. Preparation and staining of skeletal muscle, Squamous epithelium & blood film (Human)

3+3+6 = 12

3. Preparation of onion root tips for chromosomal study, Preparation of buffer and determination of pH; Identification of Stages of Mitosis.

10

4. Submission of field report on the basis of Farm/field visit.

4

5. Submission of laboratory Note Book & Viva Voce

4+4=8

**Department of Zoology**  
**Tripura University (A Central University)**  
**B.Sc. Zoology (Elective)**  
**Proposed Syllabus (Under Semester System)**

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1 <sup>st</sup> Year	Semester I	Paper -1	U-I. Non Chordates I (Without Coelom) U-II. Non Chordates II (With Coelom) U-III. Chordates I (Protochordates to fish) U-IV. Chordates II (Amphibia to mammals)	100
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3 <sup>rd</sup> Year	Semester- V	Paper-5A	U-I. Parasitology and Medical Entomology U-II. Microbiology and immunology	50
		Paper-5B	Practical Based on Theory of Paper-V-A	50
	Semester-VI	Paper - 6	<b>Project in Zoology</b> i. Project Preparation (literature review, field work/lab work) - 50 ii. Presentation - 25 iii. Viva - 25	100

## Semester – II

### Paper – 2A

#### Unit –I: Cell Biology, Histology and Developmental Biology

- Ultra-structure and function of different cell organelles-Plasma membrane, Golgi complex, Mitochondria & Endoplasmic Reticulum.
- Ultra-structure of Chromosome with special reference to Nucleosome model.
- Cell cycle, Mitotic & Meiotic Cell Divisions.
- Outline classification, distribution and functions of Animal tissues.
- Histology and Functions of Skin, Liver, Pancreas, Thyroid, Testis and Ovary in mammals.
- Gametogenesis, Ultra structure of sperm and ovum in mammals.
- Physico-chemical events in fertilization. Egg Types, Cleavage and Blastulation in Amphibians. Role of Yolk in Cleavage.
- Fate Map and Gastrulation in frog
- Extra-embryonic Membrane: Formation and Function in Chick Embryo.
- Placenta : Types , Formation ( Rabbit ) and Function

#### Unit-II: Biochemistry, Animal Physiology and Endocrinology

- Classification, structure and function of carbohydrates
- Classification, structure and function of Protein
- Classification, structure and function of lipids
- Structure and function of Nucleic acid
- Concept of pH and buffer and their biological significance
- Enzymes – General properties, coenzymes, isoenzymes, allosteric enzymes, Mechanism of enzyme action, Factors affecting enzyme reaction
- Heterotrophic Nutrition ; Intracellular digestion in Protozoa, Extracellular digestion in general, Cellular digestion in Termite, Cattle and Horse
- Exchange of Gases: Respiratory pigments and their advantages, Oxygen and Carbon dioxide transport.
- Excretion and Osmo-regulation: Urine formation in mammals; Nitrogen excretion in Ammonotelic, Ureotelic and Uricotelic animals, Osmo-regulation in Fresh Water and Marine Vertebrates
- Physiology of Nerve Impulse conduction , Synaptic Transmission
- Brief outline of organization and functions of endocrine system in mammals with special reference to: Pituitary, Thyroid and Gonads.
- Reproductive Cycle (estrous cycle) and its hormonal control.

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# TRIPURA UNIVERSITY

SYLLABUS OF ZOOLOGY, 2014

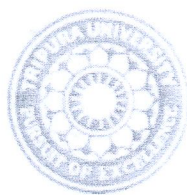
2<sup>nd</sup> Semester

PAPER – II B

MINOR

Total Marks = 50

1. Identification with reasons ( Any five) 4x5 = 20
  - a) Paramoecium, Sycon, Obelia, Fasciola, Ascaris, Earthworm, Cockroach, Pila, Starfish, Branchiostoma, Ascidia, Petromyzon, Scoliodon, Labeo, Toad, Snake ( Naja), Pigeon, Rat, Chiroptera.
  - b) Identification of Cell division stages (Mitosis) with reasons. (Any one) 1x4=4
2.
  - a) Identification with characters of mammalian T.S. of Liver , Pancreas, Kidney, Thyroid, Testes, Ovary ( any one)
  - b) Chick Emryo : 24 hrs, 48 hrs & 72 hrs ( any one ) 3+3 = 6
3. Biochemistry : Identification of Glucose, Starch & Protein.  
Animal Physiology : Staining & Mounting of Human Squamous Epithelial tissue/Blood film .  
Preparation of buffer, determination of pH. 5x2 = 10
4. Laboratory Note Book Submission & Viva Voce 5+5=10



# **TRIPURA UNIVERSITY**

**(A Central University)  
Suryamaninagar-799022**

## **Syllabus OF Zoology (General & Major)**

**Semester – III**

**2014**



Tripura University  
Semester-III  
ZOOLOGY (GENERAL)  
Paper - 3A

Full Marks: 50

(40+10)

Unit - I

Taxonomy & Classification, Evolution & Adaptation

Period 20

1. Definition, Systematics, Taxonomy, Classification, Phenon. Taxon, Category, Binomial and Trnomial nomenclature
2. Taxonomy Hieracrhy
3. Biological species concept
4. General characteristics and classification
  - (i) Porifera, Cnideria & Annelida – up to subclass
  - (ii) Amphibia & Reptilia – up to order
5. Darwinism and post Darwinian synthetic theory of evolution
6. Selection: stabilizing, directional and disruptive selection with example: evolutionary significance of each kind of selection
7. Isolating mechanism and speciation (allopatric, sympatric and parapatric)
8. Morphological and physiological adaptation of – i. Camel, ii. Whale, and iii. Bat.
9. Animal colouration and mimicry

Unit - II

Ecology, Ethology, Zoogeography & Biodiversity

Period - 20

1. Ecosystem: Definition, components, energy flow, food chain, food web, ecological pyramids.
2. Population ecology: properties and growth form; population regulation
3. Community ecology: Species diversity, stratification of forest, trophic structures, habbit and niche concept
4. Community succession: characteristics, types and causes of ecological succession
5. Social insects (termites and honey bee) and their behavior
6. Types of animal distribution: cosmopolitan, discontinuous, endemism, bipolar
7. Barriers and their roles in animal distribution
8. Zoogeographical realms: geographical range, physical features, faunal characteristics
9. Concept of biodiversity, causes of depletion of biodiversity: strategies of biodiversity conservation- *exsitu* and *insitu* methods.

Note: Internal assessment of 10 marks based on the above syllabus.

# TRIPURA UNIVERSITY

## SEMESTER – III

### Zoology (Major)

#### Paper – 3A

Full Marks – 60

(48+12)

Periods - 24

#### Unit I: Genetics

- DNA as genetic material.
- Concept of Alleles and Multiple Alleles (ABO - Blood Group).
- Linkage -Types & Gene Mapping.
- Crossing over and Recombination – Molecular basis and Significance.
- Sex Determination in *Drosophila* (Gynandromorphism, Genic Balance Theory & Dosage Compensation).
- Sex Determination in Human (Role of Y-Chromosome or *Sry* gene, citing examples of Turner's & Klinefelter's Syndromes).
- Mode of Inheritance of Autosomal Chromosome (Albinism & Thalassaemia) and Sex-Linked Chromosome (Colour Blindness and Haemophilia).
- Mutation : Types, Agents, Induction and Detection of mutation (CIB Method).
- Method of detecting Biochemical Mutants: Metabolic Blockage of Arginine pathways in *Neurospora*.
- Human genetic disorders: a) Phenylalanine pathway (Alkaptonuria and Phenylketonuria), b) Tyrosine pathway (Albinism), c) Sickle Cell Anaemia.
- One Gene – One Polypeptide Hypothesis – present status.

#### Unit II: Ecology

Periods - 24

- **Basic concept:** a) Biotic and Abiotic Factors, b) Energy Flow in Ecosystems (Lindemann Model), implications of thermodynamic laws c) Interspecific Interactions in Ecosystem (Commensalism, Mutualism and Parasitism).
- **Population Ecology:** a) Attributes of natural Populations b) Population dynamics - Growth form and growth equations; c) Demography, life table types and survivorship curves
- **Community Ecology:** a) Species Diversity, Relative Abundance and Species Dominance, b) Stratification of Forest, c) Trophic Structure, d) Multidimensional Concept of Ecological Niche, e) Principles of Competitive Exclusion and species co-existence.
- **Community Succession:** Characteristics, Types and Causes of Ecological Succession a) Autogenic and Allogenic Succession, (b) Primary and Secondary Successions, d) Ecotone - features and formation, e) Edge Effect.
- **Behavioral Ecology:** Migration in birds
- **Environmental Pollution:** a) Air and Water (Sources and kinds), b) Acid rain, CFC and Ozone Depletion, c) Greenhouse effect and Global warming, d) Bio-magnification and Eutrophication – Causes and Significance with examples, e) Human Population Growth and its impact on environment;
- **Conservation of threatened wild life:** National and International Initiatives i) Indian Wildlife Protection Act 1972, ii) WWF, iii) IUCN, iv) Indian Biodiversity Act 2002.
- **Note:** Internal Assessment of 12 marks based on the above syllabus.



Tripura University  
Semester-III  
ZOOLOGY (GENERAL)  
Paper – 3B  
Practical

Full Marks 50  
(40 +10)

Time : 4 hours

- |   |       |
|---|-------|
| 1. Study of biotic community (Soil & Water ) and their significance ( any two)  | 3x2=6 |
| 2. Determination of Population Density by Quadrate method   | 6     |
| 3. Estimation of Dissolved Oxygen in water and determination of pH  | 6+2=8 |
| 4. Adaptive features of Physallia, Fasciola, Ascariis, Hirudinaria, Octopus, Exocoetus<br>Tree frog, Hemidactylus, Chiroptera. (any three ) | 3x2=6 |
| 5. Field visit and submission of Field Note Book  | 6     |
| 6. Practical Note Book  | 4     |
| 7. Viva Voce  | 4     |

Note: Internal assessment of 10 marks based on the above syllabus.

TRIPURA UNIVERSITY  
SEMESTER – III  
Zoology (Major)

Practical - Paper – 3B

Marks 40 ( 32 + 8 )

TIME : 4 Hours

- 1) Preparation and identification of Polytene Chromosome of *Drosophila* Larvae. ( 5 )
- 2) Pedigree analysis of common human traits ( 4 )
- 3) Identification of meiotic cell division ( any stage ) ( 2 )
- 4) Estimation of population by Capture – Recapture method by Hypothetical beads population. ( 5 )
- 5) Estimation of Dissolved Oxygen ( 4 )
- 6) Spot Identification and role of biotic community of soil and water :  
( Any Two ) a) Soil Mite b) Termite c) Collembola d) Ants  
e) Earthworm f) Daphnia g) Cyclops ( 3+3=6 )
- 7) Laboratory Note Book ( 3 )
- 8) Viva voce ( 3 )

NOTE : Internal Assessment of 8 Marks based on the above syllabus



# **TRIPURA UNIVERSITY**

**(A Central University)  
Suryamaninagar-799022**

**Syllabus**

**OF**

**Zoology  
(General & Major)**

**Semester - IV**

**2014**

**Semester – IV (Honours / Major)**

**Paper 4A      Theory**

**60 (48 + 12)**

**Unit I:            Microbiology, Parasitology and Immunology**

- 1) General characters and major classification of microbes.
- 2) Microbes in human and animal welfare.
- 3) Common microbial diseases (Cholera and Amoebiasis), their treatment and control.
- 4) Life cycle, pathogenicity, clinical features and control measures of *Plasmodium vivax*, *P. falciparum*, *Wuchereria bancrofti* and *Anchylostoma duodenale*.
- 6) Host-parasitic interaction with reference to helminthes (*Taenia* sp. and roundworms) diseases.
- 7) Major cells types and organs of immune system; primary and secondary lymphoid organs; types of immune system: Cell mediated immune system & humoral immune system; Concept of antigens and types of antibodies

**Unit II:            Tools and techniques in Biology**

**(15 lectures) 12x2 = 24**

- 1) Principle and applications of pH meter, ii) colorimeter, and iii) Centrifuges
- 2) Principle and applications of i) Chromatography ii) Electrophoresis
- 3) Principle and application of i) Light microscope (Bright-field and Phase Contrast) and Electron microscope (SEM & TEM)
- 4) Micro-techniques: Fixation, dehydration, embedding, block-making, microtomy, Principle of staining, acid and basic stains, Single & double staining methods

**N.B:** Internal assessment of 12 marks based upon above syllabus.

**Paper 4B      Practicals (based on theory paper)**

**40 (28 + 12)**

- 1) Spot identification of parasites: *Entamoeba sp.*, *Ascaris sp.*, *Anchylostoma sp.*, *Taenia sp.*
- 2) Adaptive features of: *Fasciola hepatica*, *Ascaris lumbricoides*, *Taenia solium*, *Anchylostoma duodenale*, *Hirudinaria sp.*
- 3) Gram staining of bacteria
- 4) Collection and preparation of gut parasites of cockroach and fowl
- 5) Double staining method (H-E) of liver, kidney and testis tissues
- 6) Lab note book
- 7) Viva voce

**N.B:** Internal assessment of 12 marks based upon above syllabus.

**Semester – IV (Pass / Minor)**

**Paper 4A      Theory**

**50 (40 + 10)**

**Unit I:          Applied Zoology II**

1. Sericulture: Species of silk worms, food plants and silk varieties in India; Life history and rearing method of *Bombyx mori*, its diseases and control measures.
2. Apiculture: Species of honey bees in India; Life history and rearing methods of *Apis indica*; Bee products and their uses.
3. Vermiculture: Major vermicomposting species in India; Principle, method and importance of vermicomposting.
5. Prawn culture: Indian prawns of commercial value – Penaeid and non-penaeid groups, Prawn culture and hazards in prawn farming.

**Unit II:          Genetics and Molecular Biology**

1. Mendelian principle of segregation and independent assortment
2. Linkage, Recombination, Cytoplasmic inheritance
3. Concepts of alleles and multiple alleles
4. Sex determination in *Drosophila* and man; Sex chromatin or Barr body and its significance
5. Congenital chromosomal abnormalities: Down, Turner and Klinefelter syndrome
6. Mode of inheritance of autosomal and sex-linked genes with reference to albinism and colour blindness
7. DNA as a genetic material – experimental proof
8. Replication, Transcription and Translation in prokaryotes

Paper 4B      Practical

50 (40 + 10)

A. Applied Zoology

1. Spotting and economic importance of the following specimens (Any three)

- a. ~~*Tripodhiza*~~ sp. *Tryporyza* sp.
- b. *Sitophilus* sp.
- c. *Bandicoota* sp.
- d. *Bombyx* sp.
- e. *Apis* sp.
- f. *Perionyx* sp.
- g. *Macrobrachium* sp.

B. Genetics

- 2. Preparation and staining of cell division (onion root tip)
- 3. Identification of Mitotic / Meiotic division stages
- 4. Studies of Barr body in man.

C. Viva Voce

D. Lab Note Book



# **TRIPURA UNIVERSITY**

**(A Central University)  
Suryamaninagar-799022**

**Syllabus**

**OF**

**Zoology (General & Major)**

**Semester – V**

**2014**



**TRIPURA UNIVERSITY****Semester – V (Theory)****Zoology (Major)****Paper: 5A****Total Marks 100 (80+20)****Unit-I: Adaptation, Zoogeography & Ethology****(15 lectures)**

1. Convergent and divergent adaptation and adaptive radiation in placental mammals with reference to teeth & limbs.
2. Morphological, anatomical and physiological adaptations in Pigeon, Camel and Whale.
3. Colouration - Cryptic & Warning.
4. Mimicry - Protective, Aggressive and Warning (Batesian and Mullerian).
5. Continental Drift theory and Discontinuous distribution of animals.
6. Zoogeographical realms (geographical composition, climate and faunal characteristics) - i) Ethiopian, ii) Oriental and iii) Australian.
7. Basics of animal behaviour; Innate and Learned behaviours (characteristics, differences, classification & examples).
8. Communication in animals with reference to pheromone and its role in territory marking, courtship and mating.

**Unit-II: Animal Physiology****(15 lectures)**

1. Physiology of digestion in mammals.
2. Transport of  $O_2$  and  $CO_2$  in the blood of mammals, Bohr Effect, Chloride Shift.
3. Respiration in i) Lata, ii) Shark, iii) Pigeon and iv) Human
4. Excretion: i) Nitrogen excretion in vertebrates (fish, bird, mammal), ii) Hypertonic urine formation in mammals.
5. Osmoregulation in fresh water fish and marine fish.
6. Generation of action potential and transmission of nerve impulse; mechanism of synaptic transmission.

### Unit-III: Biodiversity and Conservation

(15 lectures)

1. Concept of Biodiversity; Types: Hierarchical levels (Genetic diversity, Species diversity), Community and Ecosystem diversity (alpha, beta and gamma diversity).
2. Biodiversity as a resource; changes/depletion of biodiversity and its causes.
3. Hot spots of biodiversity, Strategies for conservation of biodiversity (*ex-situ* and *in-situ* methods).
4. IUCN threatened categories: Endangered, Critically endangered, Vulnerable and Rare species.
5. Wild-life conservation with reference to Tiger and Rhino.
6. Protected area, Wildlife protection act, Biosphere reserves, National park and Sanctuaries; CITES.

### Unit-IV: Biostatistics

(15 lectures)

1. Concept of mean, mode and median; their relationship.
2. Elementary concepts of probability and distribution
  - (a) Standard deviation (b) Standard error (c) Variance (d) t-test
  - (e) Simple-correlation coefficient, (f) Chi-square test.
3. Representation of statistical data:
  - a) Bar diagram
  - b) Histogram
  - c) Frequency Polygon
  - d) Line graph
  - e) Pie chart

Internal assessment of 20 marks based on the above study material

**TRIPURA UNIVERSITY**

**Semester – V (Practical)**

**Zoology (Major)**

**Paper: 5B**

**Practical paper**

**100 (80 + 20)**

1. Morphological , behavioural and other adaptive features - *Anabas sp.*,  
*Exocoetus sp.*, *Amphipnous sp.* *Hyla sp* (Tree frog)., *Axolotl of Ambystoma*  
*sp.*, *Chamaeleo sp.*, *Gekko sp.*, *Naja sp.*, *Columba sp.*, *Psittacula sp.*  
(Parrot), *Pteropus sp.*, *Bandicoota sp.*(any five). 4x5=20
2. Studies on Zoogeography: placement of 5 specific/ endemic/ characteristic  
animals in their respective zoogeographical realm. 5+3= 8
3. Principle, procedure, display, drawing and labelling (any two of the  
followings) 7x2=14
  - a) Studies on human blood group.
  - b) Studies on haemin crystals in human
  - c) Preparation of human blood film; identification of WBC.
4. Problems on Chi-square test and t-test: Principle, calculation, result and  
inference (any one). 2+10+3=15
5. Observation on water/soil/terrestrial animal biodiversities (local fauna) and  
submission of field study report. 10
6. Laboratory note book. 7
7. Viva. 6

**Internal assessment of 20 marks based on the above study material**

**TRIPURA UNIVERSITY**

**B.Sc. Zoology (General)**

**Semester V**

**Paper: 5A**

**50**

**Unit-I: Parasitology and Medical Entomology**

**(15 lectures)**

1. Life cycle, pathogenicity, clinical features and control measures of –
  - (a) *Plasmodium vivax*
  - (b) *Entamoeba histolytica*
  - (c) *Ascaris lumbricoides*
2. Parasitic adaptations in helminthes with reference to *Ascaris lumbricoides* and *Taenia solium*
3. Common insect vectors related to public health: their features and the disease (s) caused by these vectors –
  - a) Mosquitoes (*Anopheles*, *Culex*, *Aedes*)
  - b) House fly (*Musca sp.*)
  - c) Bed bug (*Cimex sp.*)
  - d) Head louse (*Pediculus sp.*)

**Unit-II: Microbiology and Immunology**

**(15 lectures)**

1. Types of Microbes and their important features.
2. Disease causing Microbes with reference to Cholera and Tuberculosis, mode of transmission.
3. Microbes in human gut and their beneficial role; concept of Probiotics.
4. Immune system – cells and organs of immune system, types of immune responses.
5. Antibodies types and its modal structure; antigen and antibody interaction.

Internal assessment of **10 marks** based on the above study material

**TRIPURA UNIVERSITY**

**B.Sc. Zoology (General)**

**Practical paper**

**Paper: 5B**

**Practical paper**

**50 (40+10)**

1. Identification with reasons: (any two)  $5 \times 2 = 10$ 
  - a) *Entamoeba histolytica*
  - b) *Giardia intestinalis*
  - c) *Plasmodium* Sp.
  - d) *Ascaris lumbricoides*
  - e) *Culex* sp.
  - f) *Musca* sp
  - g) *Cimex* sp.
2. Adaptive features in *Fasciola* sp., *Ascaris* sp., *Taenia* sp. (any one). 5
3. Collection and preparation of gut fauna in cultivable fishes and fowl.  
 $3+2+3 = 8$
4. Submission of life history stages of mosquito in glass bottle & also on drawing sheet.  $4+3 = 7$
5. Lab Note Book. 5
6. Viva. 5

Internal assessment of 10 marks based on the above study material

**TRIPURA UNIVERSITY**  
**Semester – IV (Major / Theory)**

**Paper 4A      Theory      60 (48 + 12)**

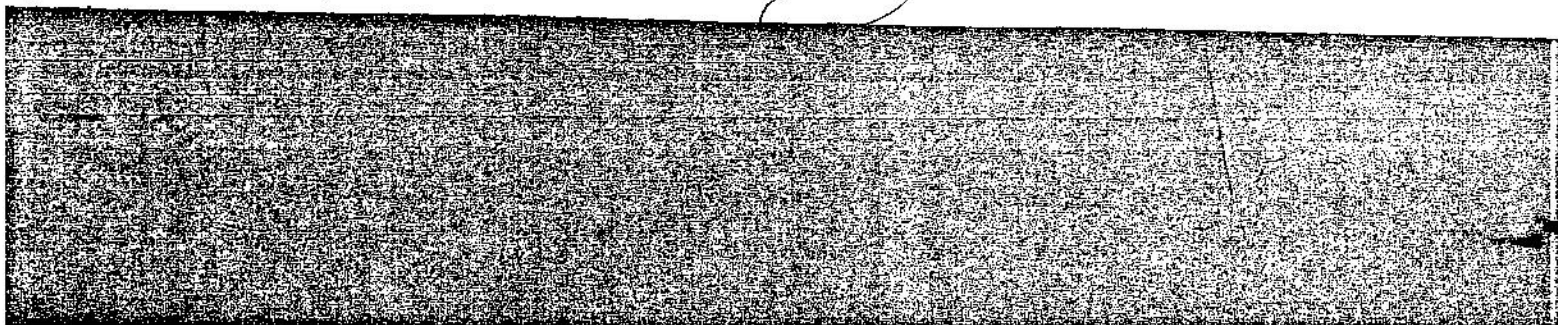
**Unit I:      Microbiology, Parasitology and Immunology      (15 lectures)**

- 1) Types of Microbes and their important features.
- 2) Microbes in Human welfare and the concept of probiotics.
- 3) Common microbial diseases (Cholera and Amoebiasis) their treatment and control.
- 4) Life cycle, pathogenicity, clinical features and control measures of *Plasmodium vivax*, *Plasmodium falciparum*, *Wuchereria bancrofti*, *Ancylostoma duodenale*.
- 6) Host parasitic interaction with reference to helminthes (*Taenia* sp. and round worm) diseases.
- 7) Immune system - major cell types and organs of immune system; types of immune response; antigen – antibody reaction; antibody types and its model structure.

**Unit II:      Tools and techniques in Biology      (15 lectures)**

- 1) Principle and application of i) pH meter ii) colorimeter and iii) Centrifuges
- 2) Principle and application of i) Chromatography and ii) Electrophoresis.
- 3) Principle and application of i) Light microscope (Bright-field and phase contrast) and ii) Electron microscope (TEM & SEM).
- 4) Micro-techniques: Fixation, dehydration, embedding, block-making, microtomy, principle of staining, acid and basic stains, single & double staining method.

**N.B:** Internal assessment of 12 marks based upon above syllabus.



**TRIPURA UNIVERSITY**  
**Semester – IV (Major / Practical)**

**Paper 4B      Practical (based on theory paper)      40 (32 + 8)**

- |  |           |
|--|-----------|
| 1) Spot identification of parasites: <i>Entamoeba sp</i> , <i>Ascaris sp</i> , <i>Ancylostoma sp</i> ,<br><i>Taenia sp. (any one)</i>                                    | 3         |
| 2) Adaptive features of: <i>Fasciola hepatica</i> , <i>Ascaris lumbricoides</i> , <i>Taenia solium</i> ,<br><i>Anchylostoma duodenale</i> , <i>Hirudinaria (any one)</i> | 4         |
| 3) Gram staining of bacteria   | 4         |
| 4) Collection and preparation of gut parasites of cockroach and fowl   | (2+3+2)7  |
| 5) Double staining method (H-E) of liver, kidney and testis tissue   | (4+1+2) 7 |
| 6) Lab note book   | 3         |
| 7) Viva voce   | 4         |

Total = 32

**N.B:** Internal assessment of **8 marks** based upon above syllabus.

**TRIPURA UNIVERSITY**  
**Semester – IV (General/ Theory)**

**Paper 4A      Theory**

**50 (40 + 10)**

**Unit I:            Applied Zoology II**

**(15 lectures)**

1. Sericulture: Species of silk worm, food plants and silk varieties in India, Life history and rearing method of *Bombyx mori*, its diseases and control measures.
2. Apiculture: species of honey bees in India; life history and rearing methods of *Apis indica*; bee products and their uses.
3. Vermiculture: Major vermicomposting species in India; Principle, method and importance of vermicomposting.
4. Prawn culture: Indian prawns of commercial value; Penaeid and non-penaeid group. Prawn culture and demerits in transportation of prawn seeds.

**Unit II:            Genetics and Molecular Biology**

**(15 lectures)**

1. Mendelian principle of segregation and independent assortment.
2. Linkage, Recombination, Cytoplasmic inheritance.
3. Concepts of alleles and multiple alleles.
4. Sex determination in *Drosophila* and man; Sex chromatin or Barr body and its significance.
5. Congenital chromosomal abnormalities: Down, Turner and Klinefelter syndrome.
6. Mode of inheritance of autosomal and sex-linked genes with reference to albinism and color blindness.
7. DNA as a genetic material – experimental proof.
8. Replication, Transcription and Translation in prokaryotes.

**N.B:** Internal assessment of **10 marks** based upon above syllabus.



**TRIPURA UNIVERSITY**  
**Semester – IV (General / Practical)**

50 (40 + 10)

**Paper 4B (Practical based on theory paper)**

**A. Applied Zoology**

3x4=12

1. Spotting and economic importance of the following specimens (Any three)

- a. *Tryporyza sp*
- b. *Sitophilus sp*
- c. *Bandicoota sp*
- d. *Bombyx sp*
- e. *Apis sp*
- f. *Perionyx sp*
- g. *Macrobrachium sp*

**B. Genetics**

2. Preparation and staining of cell division (onion root tip).

(4+4) = 8

3. Identification of Meiotic division stages (any one)

4

(4+2) = 6

4. Studies of Barr body in man (preparation and display)

5

**C. Viva Voce**

5

**D. Lab Note Book**

Total = 40

**N.B:** Internal assessment of 10 marks based upon above syllabus.



**TRIPURA UNIVERSITY**

(A Central University)  
Suryamaninagar-799022

**Syllabus**

**OF**

**Zoology (General & Major)**

**Semester – VI**

**2014**

**TRIPURA UNIVERSITY**  
**SEMESTER - VI**  
**Zoology (Major)**  
**Paper - 6A (Theory)**  
(Marks - 100, Total Periods - 60)

Total Marks: 100 (80+20)

**Unit I: Evolutionary Biology**

**(15 Lectures)**

1. Origin of Life: Experimental evidence in favour of Abiotic synthesis of Basic Biomolecules (Urey-Miller Experiment); origin of organized structure of Protocell or Coacervate.
2. Basic ideas on Geologic time table with major examples of fauna.
3. Neo- Darwinism; Genetic variations and sources of variations in a natural populations.
4. Hardy Weinberg Principle and factors influencing changes in the gene frequency (problems excluded).
5. Types of Natural selections: Stabilizing, Directional, and Disruptive selections with examples.
6. Isolating Mechanisms and importance of Reproductive Isolation.
7. Modes of Speciation: Sympatric, Allopatric and Parapatric processes.

**Unit II: Biochemistry**

**(15 Lectures)**

1. Concept of pH and buffer and their biological applications.
2. Structures and functions of carbohydrates, lipids proteins and nucleic acids;
3. Enzymes- general properties; definitions and characteristics of coenzymes, isoenzymes and allosteric enzymes with examples;
4. Mechanism of enzyme action; factors affecting reaction rates;
5. Glycolysis , TCA cycle and ATP generation.

### Unit III: Endocrinology and Reproductive biology

(15 Lectures)

1. Histological structures and functions of Pituitary, Thyroid, Pancreas, Testes and Ovary;
2. Endocrine disorders in human with special reference to pituitary and thyroid glands.
3. Types of Hormones : vertebrates and invertebrates with special reference to insects ;
4. Hormonal control of spermatogenesis and oogenesis;
5. Process of ovulation and its hormonal control;
6. Reproductive cycles in mammals with special reference to oestrous cycle in rat.

### Unit IV: Molecular Biology and Genetic Engineering

(15 Lectures)

1. Replication, transcription and translation in prokaryotes;
2. Benzer's rII locus, idea of complementation and non-complementation;
3. Concept of cistron, recon and muton;
4. Genetic regulation in Prokaryotes-*Lac* Operon ;
5. Genetic basis of Cancer:
  - a) Proto-oncogenes and viral oncogenes
  - b) Transformation of proto-oncogene to oncogene
  - c) Functional importance of p53 tumour suppressor gene
  - d) Oncogenes in human cancer: *Src*, *ras*, *bcr/abl*
6. Recombinant DNA technology and its applications:
  - a) Cloning vectors
  - b) Types of endonucleases and their roles
  - c) Construction of chimeric DNA
  - d) Copying mRNA into cDNA clones with desired DNA
  - e) Potential benefits and hazards of genetic engineering.



**TRIPURA UNIVERSITY**

**(A Central University)**

**Suryamaninagar-799022**

**Syllabus**

**OF**

**Zoology**

**Major – Semester – VI**

**Paper – VIB (Practical)**  
**(Rectified)**

**2014**



**TRIPURA UNIVERSITY**  
**SEMESTER – VI**  
**Zoology (Major)**  
**Paper – VIB (Practical)**

**Total Marks: 100 (80+20)**

1. Identification of bones (comparative aspects): Skull, limb bones (Humerus, Radius-ulna, femur, tibia-fibula) and girdle bones of toad, lizard, pigeon and guinea pig (any one pair of bones representing two different vertebrates). 10 x 1 = 10
2.    a) Study of Salivary amylase action. 10x1=10  
      b) Quantitative estimation of Glucose (by titrimetric method).  
      (any one to be given in the examination)
3. Identification and characterization of the histological slides of the following endocrine glands of mammal with drawing, labeling & comments:  
   i. Pituitary, ii. Thyroid, iii. Adrenal, iv. Pancreas (Islets of Langerhans), v. Testis &  
   vi. Ovary. (slides of any two glands to be given in the examination) 10 x 2 =20
4. Determination of genotype frequency and allele frequency with example (any one to be given in the examination) 10x1=10
5. Identification with characters of Human Syndrome/Disorder from the sample of karyotype provided:  
      i) Klinefelter's  
      ii) Turner's  
      iii) Down's  
      iv) Super female  
      (any one to be given in the examination) 10x1=10
6. Submission of Laboratory Note book. 10
7. Viva 10
- Internal assessment based on practicals (1 to 5 of the above). 20**