

SURENDRANAGAR

UNIVERSITY

SURENDRANAGAR

SCHOOL OF SCIENCE

[Three Years (6 Semesters) Full Time Course]

ZOOLOGY SYLLABUS

WITH EXAMINATION CODING SYSTEM

16-03-04-01-01-01-00

16-03-04-01-01-02-00

2021 - 22

Surendranagar University

Wadhwan kothariya road, Surendranagar.

Gujarat, India.

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EXAMINATION CODING SYSTEM

Sr.No.	Name Of Programme	B.Sc. ZOOLOGY	
1	Title Of Paper	(In Sem -I) Non Chordates : Systematics, Forms & Functions, Cell biology & Genetics, Applied Zoology and Ecology	(In Sem -II) Chordate: Systematic, Forms & Functions, Physiology & Histology Wild life biology and Comparative account of integuments, Reproductive physiology Embryology
2	Theory Credit	4	4
3	Practical Credit	3	3
4	Total Credit	7	7
5	External Marks Of Theory	70	70
6	Internal Marks Of Theory	30	30
7	Total Marks Of Theory	100	100
8	External Marks Of Practical	35	35
9	Internal Marks Of Practical	15	15
10	Total Marks Of Practical	50	50
11	Grand Total	150	150
12	External Exam Time Duration	2½ Hours	2½ Hours

Course / Paper Code					
13	Year	1	6	1	6
14	Faculty	0	3	0	3
15	Subject	0	4	0	4
16	UG/PG	0	1	0	1
17	Semester	0	1	0	2
18	Paper	0	1	0	2

SURENDRANAGAR UNIVERSITY

SURENDRANAGAR

ZOOLOGY

SYLLABUS

WITH EXAMINATION CODING SYSTEM

16-03-04-01-01-01-00

16-03-04-01-01-02-00

[SYLLABUS FOR THE CHOICE BASED CREDIT SYSTEM (CBCS)]

(F.Y. B.Sc.)

SEMESTER I – PAPER – Z-01

&

SEMESTER II – PAPER – Z-02

Syllabus

INFORCE FROM JUNE – 2021

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SURENDRANAGAR UNIVERSITY

SURENDRANAGAR

[SYLLABUS FOR CHOICE BASED CREDIT SYSTEM (CBCS)]

INFORCE FROM JUNE – 2021

SUBJECT: ZOOLOGY

WITH EXAMINATION CODING SYSTEM

16-03-04-01-01-01-00

16-03-04-01-01-02-00

SEMESTER – I

ZOOLOGY PAPER – Z – 01

**Non- chordates:- Systematic, forms and functions, Cell biology & Genetics,
Applied Zoology and Ecology**

SEMESTER – II

ZOOLOGY PAPER – Z – 02

**Chordate: Systematic, Forms & Functions, Physiology & Histology Wild life
biology and Comparative account of integuments, Reproductive physiology
Embryology**

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SURENDRANAGAR UNIVERSITY

SURENDRANAGAR

(CBCS Syllabus)

SEMESTER – I

ZOOLOGY

16-03-04-01-01-01-00

PAPER – Z-01

**Non- chordates:- Systematic, forms and functions, Cell biology & Genetics,
Applied Zoology and Ecology**

UNIT – 1: SYSTEMATICS

Salient feature & classification up to classes in Non-chordates, structural

Organization in different phylum of Non-chordates with examples.

Phylum- Protozoa, Porifera, Coelenterata, Platyhelminthes, Aschelminthes,

Annelida, Arthropoda, Mollusca, Echinodermata,

Hemichordata.

UNIT – 2: FORMS AND FUNCTIONS IN ANIMALS

General structures and morphology with functional anatomy of following
type Animals.

2.1 PLATYHELMINTHES – Type study: Taenia solium.

2.2 ANNELIDA – Type Study: Earth worm.

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UNIT - III CELL BIOLOGY & GENETICS

3.1 Cell Biology: Only structure and function of following organelles.

- (i) Plasma membrane
- (ii) Endoplasmic reticulum
- (iii) Mitochondria
- (iv) Nucleus

3.2 Genetics:

Mendelian laws of heredity:

- (i) Mono hybrid cross
- (ii) Di hybrid cross

Incomplete dominance

Co-dominance

Multiple alleles (ABO Blood group in human being)

UNIT - IV APPLIED ZOOLOGY

4.1 A study of general structure and characters of following pathogenic animals

- (1) Entamoeba
- (2) Trypanosoma
- (3) Filarial worm
- (4) Guinea worm
- (5) Round worm
- (6) Pin worm

4.2 Poultry science

- (i) A general account of poultry science
- (ii) Types of poultry farming
- (iii) Different apparatus used in poultry farm

UNIT - V ECOLOGY

5.1 Introduction to ecology

5.2 Fresh water ecology

5.3 Marine ecology

5.4 Ecological adaptations:

- (i) Fossorial adaptation
- (ii) Aquatic adaptation
- (iii) Arboreal adaptation
- (iv) Volant adaptation
- (v) Desert adaptation

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PRACTICALS RELATED TO PAPER – Z-01

Practical: 1 : Identification and classification of Invertebrate animals

- (i) Phylum: Protozoa: - Arcella, Ceratium, Vorticella, Plasmodium
- (ii) Phylum: Porifera: - Leucosolenia, Euplectella, Euspongia
- (iii) Phylum: Coelenterata: - Hydra, Rhizostoma, Metridium

Practical: 2 : Identification and Classification of Invertebrate animals.

- (i) Phylum: Platyhelminthes: - Planaria, Liver fluke, Tape worm
- (ii) Phylum; Aschelminthes: - Ascaris, Hookworm
- (iii) Phylum: Annelida: - Aphrodite, Earthworm, Leech

Practical: 3: Identification and Classification of Invertebrate animals

- (i) Phylum: Arthropoda: - Peripetus, Lobster, Millipede, Dragon fly, Scorpion
- (ii) Phylum: Mollusca: - Chiton, Pila, Unio, Octopus, Dentalium

Practical: 4: Identification and Classification of Invertebrate animals

- (i) Phylum: Echinodermata: - Star fish, Brittle Star, Sea Urchin, Sea-Cucumber, and Feather Star
- (ii) Phylum: Hemichordata: - Balanoglossus

Practical: 5: Systems of Earth worm:

- (i) External Characters.
- (ii) Digestive System.
- (iii) Nervous System.
- (iv) Reproductive System
- Through chart or Multimedia

Practical: 6: Mounting of Earth worm:

- (i) Septal Nephridia
 - (ii) Body Setae
 - (iii) Blood Gland
 - (iv) Ovary
- Through chart or Multimedia or Slide

Practical: 7 : Study of permanent slides (*Taenia solium*):

- (i) Scolex
- (ii) Mature segment
- (iii) Gravid segment
- (iv) Bladder worm

Practical: 8 : Study of permanent slides (Earth worm):

- (i) T.S. Through Pharynx
- (ii) T.S. Through Gizzard
- (iii) T.S. Through Typhlosole

Practical: 09: Study of following cell organelles.

- (i) Mitochondria
 - (ii) Nucleus
 - (iii) Endoplasmic Reticulum
 - (iv) Cell Membrane
- By photograph, Chart, Model, or multimedia.

Practical: 10 : Solve the given problem of genetics

- (i) Mono hybrid ratio

- (ii) Di hybrid ratio
- (iii) Incomplete dominance,
- (iv) Co-dominance,
- (v) Multiple alleles (ABO Blood group in human being)

Practical: 11 : To determine own blood group and Rh factor

Practical: 12: Study of following pathogenic animals.

- (i) Entamoeba
- (ii) Trypanosoma
- (iii) Filarial worm
- (iv) Guinea worm
- (v) *Ascaris lumbricoides* (Round worm)
- (vi) *Enterobius vermicularis* (Pin-worm)

Practical: 13: Study of following poultry apparatus.

- (i) Types of poultry farms
 - (ii) Apparatus used in poultry farm: Feeder, Brooder, Waterer.
- By photographs, charts or by Multi-media.

Practical: 14: Study of different animals for Ecological Adaptation.

- (i) Fossorial: Earthworm, Rat.
- (ii) Aquatic: Labeo, Whale
- (iii) Arboreal: Chameleon, Monkey.
- (iv) Volant: Draco, Pigeon
- (v) Desert: Uromastix, Phrynosom

DISTRIBUTION OF UNITS

16-03-04-01-01-01-00

SEMESTER – I

<u>PAPER – Z-01</u>			
Unit No.	Unit Title	Theory Period	Marks.
Unit : 1	Systematic	10	14
Unit : 2	Forms and Functions	18	14
Unit : 3	Cell biology & Genetics	14	14
Unit : 4	Applied Zoology	13	14
Unit : 5	Ecology	10	14
TOTAL :		65	70

- Above statement concerned to only Theory portion of the paper.
- Above mentioned third column 'Theory Period' indicates total number of theory lectures per unit.
- Total syllabus should be completed within 65 theory lectures.
- Each and every unit carry equal 14 marks.
- Total marks for theory examination are 70 marks.
- **PAPER SETTER MUST FOLLOW THE UNIT WISE MARK SETUP.**

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SURENDRANAGAR UNIVERSITY –

SURENDRANAGAR

THEORY EXAMINATION

SEMESTER – I

ZOOLOGY

16-03-04-01-01-01-00

(Based on Paper – Z-01)

Time: 2½ Hours

Total Marks: 70

Instructions:

1. Illustrate your answer with neat and labeled diagrams.
2. Figure to the right side indicates full marks of questions.

QUESTION-1 (THIS QUESTION IS TAKEN FROM UNIT-1)

QUESTION-2 (THIS QUESTION IS TAKEN FROM UNIT-2)

QUESTION-3 (THIS QUESTION IS TAKEN FROM UNIT-3)

QUESTION-4 (THIS QUESTION IS TAKEN FROM UNIT-4)

QUESTION-5 (THIS QUESTION IS TAKEN FROM UNIT-5)

**- ANY TYPE OF MCQ IS NOT INCLUDED IN THIS PAPER
STYLE.**

- EACH QUESTION CARRIES EQUAL MARKS – 14.

**- THERE ARE 5 QUESTIONS CONTAINING SUBQUESTIONS
(A), (B), (C), (D).**

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QUESTION-1: (From UNIT-1) [14]



विद्या परमं बलम्

(A) Give the answer of following questions. [04]

Only short questions, Definitions and Fill in the blanks and NOT INCLUDED MCQs.

Each Question carries 1 Mark.

(1)

(2)

(3)

(4)

(B) Write any one out of Two. [02]

Each Question carries 2 Marks.

(1)

(2)

(C) Write any one out of Two. [03]

Each Question carries 3 Marks.

(1)

(2)

(D) Write any one out of Two. [05]

Each Question carries 5 Marks.

(1)

(2)

QUESTION-2: (As Above) (From UNIT-2) [14]

QUESTION-3: (As Above) (From UNIT-3) [14]

QUESTION-4: (As Above) (From UNIT-4) [14]

QUESTION-5: (As Above) (From UNIT-5) [14]

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**SURENDRANAGAR UNIVERSITY –
SURENDRANAGAR
PRACTICAL EXAMINATION
SEMESTER – I
ZOOLOGY**

16-03-04-01-01-00

(Based on Paper – Z-01)

Time: 3 Hours

Total Marks: 35

- Que -1: Sketch and label _____ system of Earth worm. [06]
- Que – 2: Sketch and label/Mountings of earth worm _____.
(Practical-6 & 7) [03]
- Que – 3: Do as per instruction and show it to examiner [03]
(Practical – 11)
- Que – 4: Do as per instruction and show it to examiner [03]
(Practical – 10)
- Que – 5: Write as per instruction. [14]
(A) Identify and classify giving reasons.
(Lower invertebrate)
(B) Identify and classify giving reasons.
(Higher invertebrate)
(C) Identify and describe. (Practical- 9)
(D) Identify and describe. (Practical-8)
(E) Identify and describe (Practical-12)
(F) Identify and describe (Practical-14)
(G) Identify and describe (Practical-13)
- Que. – 5: Report and Viva-voice. [03]
- Que – 6: Certified Journal. [03]

**SURENDRANAGAR UNIVERSITY –
SURENDRANAGAR**

**List of Slides, Specimens, Charts, Models &
Photographs**

SEMESTER – I

ZOOLOGY

16-03-04-01-01-01-00

(Based on Paper – Z-01)

LIST OF SLIDES:

- (1) All animals from Protozoa. [Practical-1, (i)]
- (2) Mountings of Earthworms. [Practical-6]
- (3) Permanent slides of Taenia solium. [Practical-7]
- (4) Permanent slides of Earth worm. [Practical-8]

LIST OF SPECIMENS:

- (1) All animal specimens from Phylum- Porifera to Phylum-Hemichordata.
[Practical-1 to Practical-4]
- (2) All animal specimens for Ecological Adaptations. [Practical-12]

LIST OF CHARTS/MODELS/PHOTOGRAPHS:

- (1) Cell organelles : Plasma membrane, Endoplasmic reticulum,
Mitochondria, Nucleus

LIST OF INSTRUMENTS:

- (1) Light Microscope
- (2) Types of Poultry Farms, Feeder, Brooder & Waterer as Poultry apparatus.

REFERENCE BOOKS

16-03-04-01-01-01-00

SEMESTER – I

List of books For Unit-1 & 2

- 1 : Invertebrate ZoologyE.L.Jordan & Dr.P.S.Verma
- 2 : Invertebrate Zoology.....P.S.Dhami &J.K.Dhami.
- 3 : A modern textbook of Zoology Invertebrate Zoology.....R.L.Kotpal.
- 4 : A textbook of Practical Zoology-Invertebrates...S.S.Lal
- 5 : Kotpal Series – Platyhelminthus..... R.L.Kotpal
- 6 : Kotpal Series – Annelida R.L.Kotpal
- 7 : Kotpal Series – ArthropodaR.L.Kotpal
- 8 : A Manual of Practical Zoology, Invertebrates.....P.S.Verma

List of books For Unit-3

- 9 : Cell Biology..... Dr. Satyeshchandra Roy.
- 10 : Cell BiologyC.B.Power
- 11 : Cytology & Genetics... P.K.Gupta
- 12 : Cell & Molecular Biology..... De Robertis.
- 13 : Biotechnological Cell Biology V.B.Rastogi.
- 14 : Molecular Biology.....V.B.Rastogi
- 15 : Histology Atlas.
- 16 : Cell Biology, Genetics, Molecular Biology, Evolution and EcologyP.S.Varma & V.K.Agrawal.
- 17 : Cytology P.S.Verma & V.K.Aggarwal
- 18 : Cytology, Genetics & Evolution... P.K.Gupta

List of books for Unit-4

- 19 : Applied ZoologyArumugam, T. Murugan, Rajeshwar, Ram Prabhu.
- 20 : Economic Zoology..... Shukla &Upadhyay.
- 21 : Economic Zoology Venkitaraman.

22 : Cell Biology, Genetics, Molecular Biology, Evolution and EcologyP.S.Varma & V.K.Agrawal.

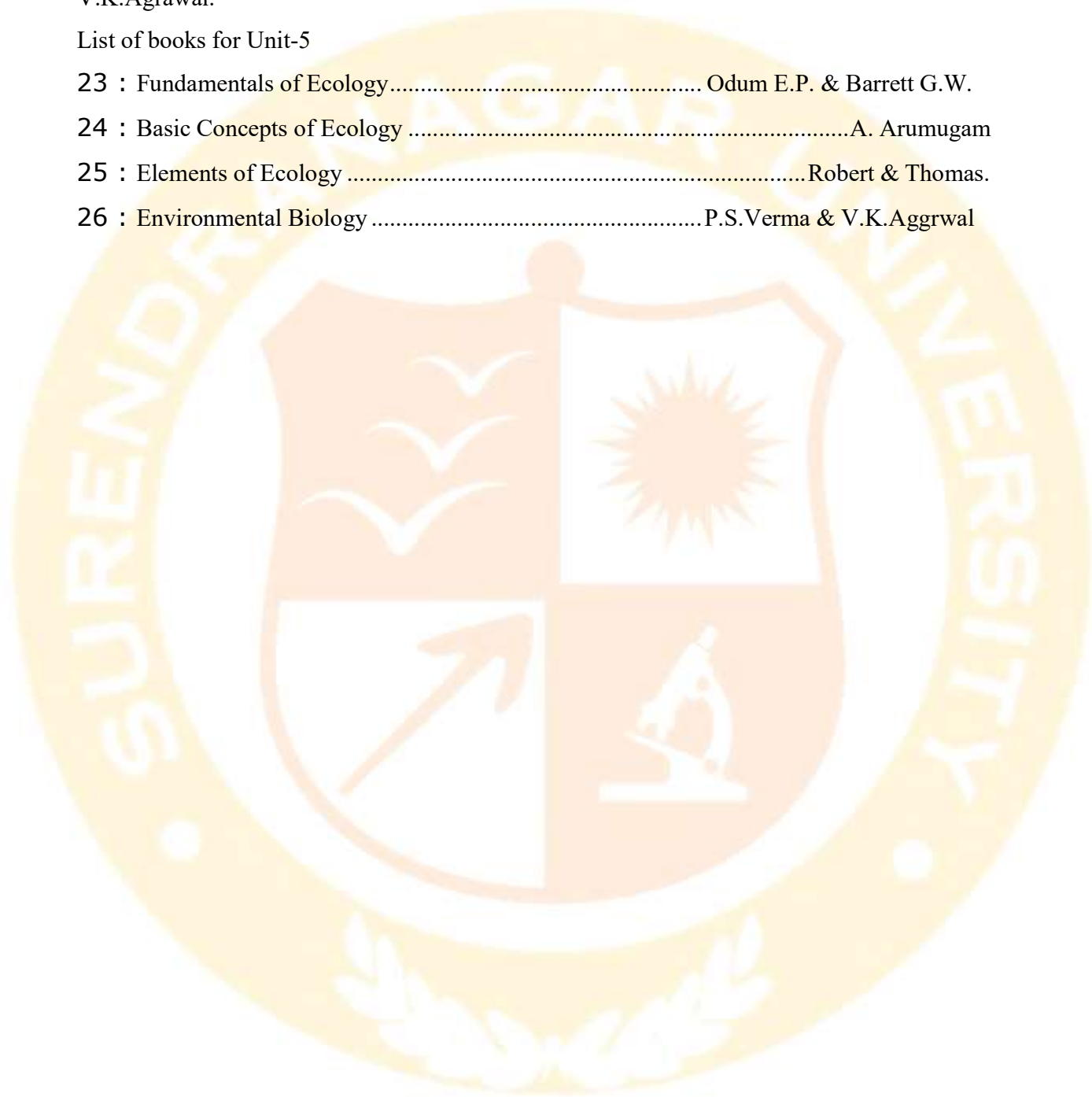
List of books for Unit-5

23 : Fundamentals of Ecology..... Odum E.P. & Barrett G.W.

24 : Basic Concepts of EcologyA. Arumugam

25 : Elements of EcologyRobert & Thomas.

26 : Environmental BiologyP.S.Verma & V.K.Aggrwal



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SURENDRANAGAR UNIVERSITY

SURENDRANAGAR

(CBCS Syllabus)

SEMESTER - II

ZOOLOGY

16-03-04-01-01-02-00

PAPER – Z-02

Chordate: Systematic, Forms & Functions, Physiology & Histology

Wild life biology and Comparative account of integuments,

Reproductive physiology Embryology

UNIT- 1: SYSTEMATIC, FORMS AND FUNCTIONS IN

ANIMALS:

1.1 Salient features and classification up to class in Chordates with examples.

UNIT- 2: FORMS AND FUNCTIONS IN ANIMALS

2.1 General structure and morphology with functional anatomy of following type.

(I) PROTOCHORDATA: Type study: Amphioxus

(i) External Features

(ii) Digestive system

(iii) Endostyle

(iv) T.S. through Pharynx region

(II) Embryonic development of Amphioxus:

- (i) Sperm
- (ii) Ovum
- (iii) Fertilization
- (iv) Blastulation
- (v) Gastrulation

UNIT- 3: PHYSIOLOGY & HISTOLOGY

3.1 PHYSIOLOGY

- (i) Physiology of digestion in the alimentary Canal.
- (ii) Absorption of carbohydrates, proteins, lipids.

3.2 BLOOD:

- (i) composition of blood.

3.3 HISTOLOGY

Stomach

Intestine

Liver

Pancreas

UNIT-4: WILDLIFE BIOLOGY & COMPARATIVE ACCOUNT OF INTEGUMENTS

5.1 General introduction of wild life biology

5.2 Difference between national Park and sanctuary

5.3 Wildlife in Gujarat:

(I) NATIONAL PARKS:

- (i) Gir National Park.

(ii) Marine National Park

(II): SANCTUARIES:

(i) Kutch desert wildlife sanctuary.

(iv) Khijadia bird sanctuary.

5.4 Methods for conservation of Wildlife & Its importance

Causes of depletion of wild life

5.5 Integumentary System:

Derivatives of integument:

Glands and digital cornification

UNIT-5: REPRODUCTIVE BIOLOGY & EMBRYOLOGY

REPRODUCTIVE PHYSIOLOGY

5.1 Menstrual cycle

5.2 Estrus cycle

5.3 Menopause

Embryology

Oogenesis

Spermatogenesis

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PRACTICAL RELATED ON PAPER – Z-02

Practical: 1 : Identification and classification of Chordate animals.

- (i) Sub-Phylum: Urochordata: Herdmania
- (ii) Sub-Phylum: Cephalochordata: Amphioxus.
- (iii) Class: Cyclostomata: Petromyzon.
- (iv) Super Class: Pisces: Shark, Electric Ray, Eel, Sea-horse.

Practical: 2 : Identification and classification of Chordate animals.

- (i) Class: Amphibia: Ichthyophis, Bufo, and Salamander.
- (ii) Class: Reptiles : Turtle, Draco, Chameleon, Mabuia (Skink),
Varanus, Snake, Crocodile.

Practical: 3 : Identification and classification of Chordate animals.

- (i) Class: Aves : Weaver Bird, Parrot, Owl, Wood pecker.
- (ii) Class : Mammal : Duck-bill, Kangaroo, Hedge hog, Bat, Dolphin

Practical: 4 : Forms and Function in Animals :

- (i) Amphioxus: External characters
 - (ii) Amphioxus: Lateral view with digestive system
 - (iii) Amphioxus: Food & feeding mechanism with endostyle
 - (iv) T.S. of pharynx in Amphioxus.
- By slides or charts or Multimedia.

Practical: 5 : Embryology of Amphioxus :

- (i) Sperm

- (ii) Ova
- (iii) Fertilization
- (iv) Cleavage
- (v) Blastulation
- (vi) Gastrulation

-By slides or charts or Multimedia.

Practical: 6 : Test of salivary Amylase for digestion of Starch.

Practical: 7 : To observe different types of blood cells by preparing blood smear

Practical: 8 : To study histology of following organs:

Stomach
Intestine
Liver
Pancreas

Practical: 09: Study of Wild animals.

- (i) Study of National parks and Sanctuaries of Gujarat state.

Practical: 10 : Study of following wild animals on the basis of zoo-geographical region as per theory

- (a) Asiatic Lion
- (b) Leopard
- (c) Corals
- (f) Spotted deer
- (g) Greater flamingo

- by photograph, Chart, stuffed animals or multimedia.

Practical: 11 : To study of Integumentary derivatives: Glands,

Practical: 12 : To study of Integumentary derivatives: Claws, Hoofs,
Nails, Horns.

Practical: 13 : General Emryology:

Study of oogenesis and spermatogenesis by chart or model.

Practical: 14 : Visit to any one National Park or Sanctuary OR Fish processing
plant OR Fishing area OR Reserve forest area.

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DISTRIBUTION OF UNITS

16-03-04-01-01-02-00

SEMESTER – II

<u>PAPER – Z-01</u>			
Unit No.	Unit Title	Theory Period	Marks.
Unit : 1	Systematic	10	14
Unit : 2	Forms and Functions	18	14
Unit : 3	Physiology & Histology	14	14
Unit : 4	Wild life biology and Comparative account of integuments,	13	14
Unit : 5	Reproductive physiology Embryology	10	14
TOTAL :		65	70

- Above statement concerned to only Theory portion of the paper.
- Above mentioned third column 'Theory Period' indicates total number of theory lectures per unit.
- Total syllabus should be completed within 65 theory lectures.
- Each and every unit carry equal 14 marks.
- Total marks for theory examination are 70 marks.
- **PAPER SETTER MUST FOLLOW THE UNIT WISE MARK SETUP.**

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SURENDRANAGAR UNIVERSITY –

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THEORY EXAMINATION

SEMESTER – II

ZOOLOGY

16-03-04-01-01-02-00

(Based on Paper – Z-02)

Time: 2½ Hours

Total Marks: 70

Instructions:

1. Illustrate your answer with neat and labeled diagrams.
2. Figure to the right side indicates full marks of questions.

QUESTION-1 (THIS QUESTION IS TAKEN FROM UNIT-1)

QUESTION-2 (THIS QUESTION IS TAKEN FROM UNIT-2)

QUESTION-3 (THIS QUESTION IS TAKEN FROM UNIT-3)

QUESTION-4 (THIS QUESTION IS TAKEN FROM UNIT-4)

QUESTION-5 (THIS QUESTION IS TAKEN FROM UNIT-5)

**- ANY TYPE OF MCQ IS NOT INCLUDED IN THIS PAPER
STYLE.**

- EACH QUESTION CARRIES EQUAL MARKS – 14.

**- THERE ARE 5 QUESTIONS CONTAINING SUBQUESTIONS
(A), (B), (C), (D).**

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QUESTION-1: (From UNIT-1) [14]



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(A) Give the answer of following questions. [04]

Only short questions, Definitions and Fill in the blanks and NOT INCLUDED MCQs.

Each Question carries 1 Mark.

(1)

(2)

(3)

(4)

(B) Write any one out of Two. [02]

Each Question carries 2 Marks.

(1)

(2)

(C) Write any one out of Two. [03]

Each Question carries 3 Marks.

(1)

(2)

(D) Write any one out of Two. [05]

Each Question carries 5 Marks.

(1)

(2)

QUESTION-2: (As Above) (From UNIT-2) [14]

QUESTION-3: (As Above) (From UNIT-3) [14]

QUESTION-4: (As Above) (From UNIT-4) [14]

QUESTION-5: (As Above) (From UNIT-5) [14]

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SURENDRANAGAR UNIVERSITY –

SURENDRANAGAR

PRACTICAL EXAMINATION

SEMESTER – II

ZOOLOGY

16-03-04-01-01-02-00

(Based on Paper – Z-02)

Time : 3 Hours

Total Marks : 35

Que – 1: Sketch and label_____system of Amphioxus. [05]

(Practical-4)

Que – 2: Sketch and label_____(Practical-5 & 13) [04]

Que – 3: Do as per instruction & show it to examiner.(Practical-6 & 7) [04]

Que – 4 : Do as per instruction and show it to examiner. (Practical-8) [03]

Que – 5 : Write as per instruction. [10]

(A) Identify and classify giving reasons.(Lower chordate)

(B) Identify and classify giving reasons. (Higher Chordate)

(C) Identify and describe. (Practical-9)

(D) Identify and describe. (Practical-10)

(E) Identify and describe. (Practical-11 & 12)\

Que – 6 : Tour Report [03]

Que – 7 :Viva – voice. [03]

Que – 8 ; Certified Journal. [03]

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**SURENDRANAGAR UNIVERSITY –
SURENDRANAGAR**

**List of Slides, Specimens, Charts, Models &
Photographs**

SEMESTER – II

ZOOLOGY

16-03-04-01-01-02-00

(Based on Paper – Z-02)

LIST OF SLIDES:

- (1) T.S. of Pharynx in Amphioxus. [Practical-4,(IV)] , Also available in Chart.
- (2) All slides of Embryology of Amphioxus. [Practical-5] , Also available in Chart.
- (3) Histological structure of mammalian organs [Practical- 8]

LIST OF SPECIMENS:

- (1) All animal specimens from Sub-Phylum-Hemichordata to Class- Mammals. [Practical-1 to 3]
- (2) Integumentary Derivatives- Glands, Claws, Hoofs, Nails & Horns. [Practical-11], Also available in chart.

LIST OF CHARTS/MODELS/PHOTOGRAPHS:

- (1) Amphioxus: External characters, Lateral view with Digestive System, Food & Feeding Mechanism with Endostyle, T.S. of Pharynx [Practical-4].
- (2) Spermatogenesis & Oogenesis. [Practical-12]
- (3) Types of eggs. [Practical-13],

(4) Integumentary Derivatives- Glands, Claws, Hoofs, Nails & Horns.[Practical-11]

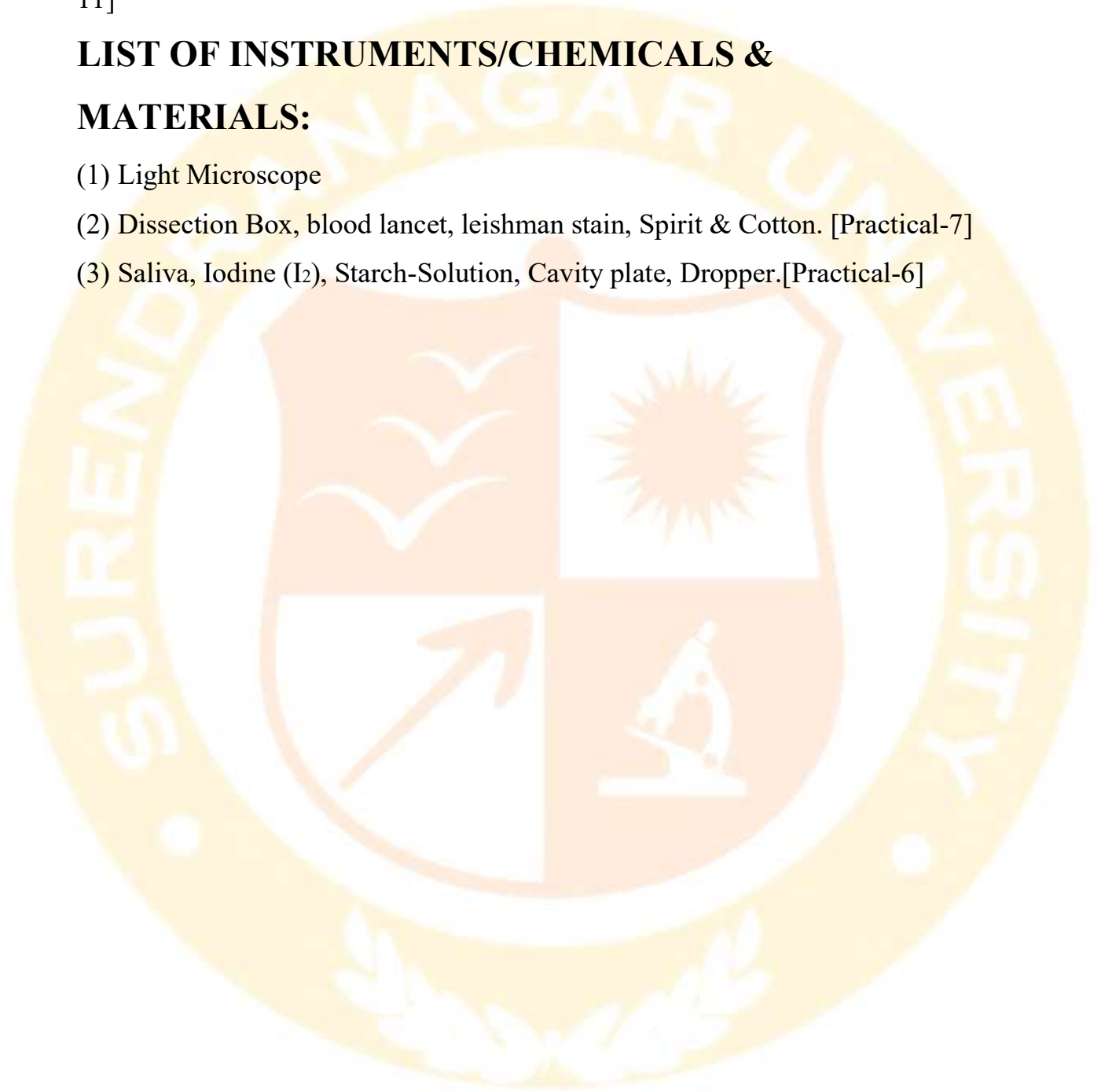
LIST OF INSTRUMENTS/CHEMICALS &

MATERIALS:

(1) Light Microscope

(2) Dissection Box, blood lancet, leishman stain, Spirit & Cotton. [Practical-7]

(3) Saliva, Iodine (I_2), Starch-Solution, Cavity plate, Dropper.[Practical-6]



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REFERENCE BOOKS

16-03-04-01-01-02-00

SEMESTER – II

List of Books for Unit -1 & 2

- 1 : Chordate Zoology E.L.Jordan & Dr.P.S.Verma
- 2 : Modern textbook of Zoology Vertebrates..... R.L.Kotpal.
- 3 : Chordate Embryology P.S.Verma & V.K.Agrawal
- 4 : A manual of practical Zoology, Vertebrates... P.S.Verma
- 5 : Practical Zoology, Vertebrates... S.S.Lal

List of Books for Unit - 3

- 5 : Animal Physiology P.K.Gupta.
- 6 : Animal Physiology V.K.Agrawal.
- 7 : Animal Physiology M.P.Arora
- 8 : A textbook of Animal Physiology Tyagi Prasum
- 9 : Human Physiology, Vol- I & II Chatterjee C.C.
- 10 : A text book of Animal Physiology..... A.K.Berry & K.Berry
- 11 : Animal Physiology & Bio-Chemistry R.A.Aggrawal & Anil k. Shrivastva & Kaushal Kumar

- 12 : Chordate Embryology P.S.Verma & V.K.Agrawal

List of Books for Unit – 4

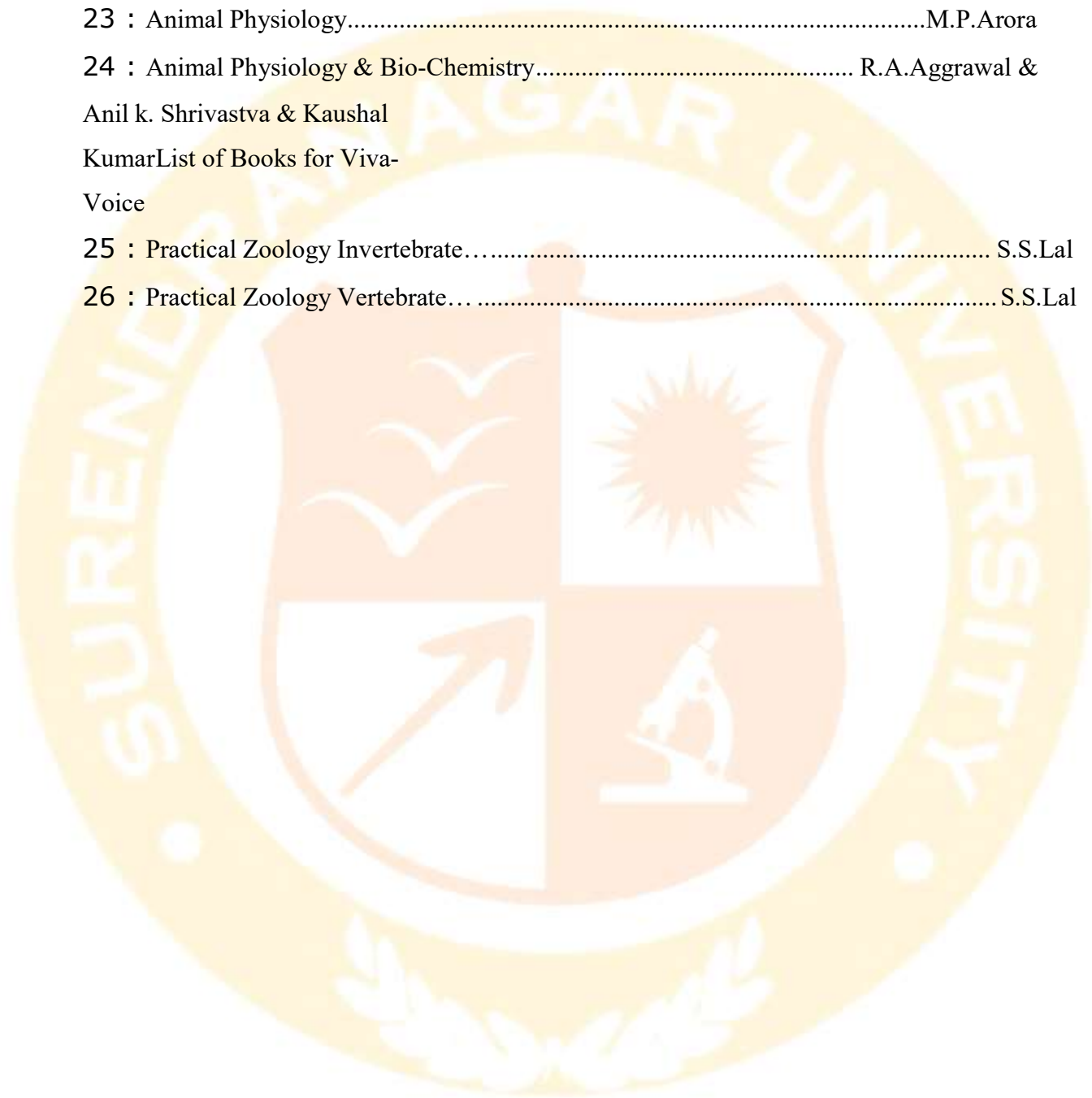
- 13 : Wild Life of Gujarat..... H.S.Singh.
- 14 : Indian National Parks and Sanctuaries..... Khati & Annand S.
- 15 : Modern textbook of Zoology Vertebrates... R.L.Kotpal
- 16 : Vertebrate Zoology E.L.Jordan & Dr.P.S.Verma
- 17 : Practical Zoology Vertebrate..... S.S.Lal

List of Books for Viva-Voices

- 18 : Practical Zoology Invertebrate..... S.S.Lal
- 19 : Practical Zoology Vertebrate..... S.S.Lal

List of Books for Unit – 5

- 20 : Reproductive Physiology A.V.Nalbandow.
- 21 : Chordate Zoology E.L.Jordan & Dr.P.S.Verma
- 22 : Modern textbook of Zoology Vertebrates.....R.L.Kotpal.
- 23 : Animal Physiology.....M.P.Arora
- 24 : Animal Physiology & Bio-Chemistry..... R.A.Aggrawal &
Anil k. Shrivastva & Kaushal
KumarList of Books for Viva-
Voice
- 25 : Practical Zoology Invertebrate..... S.S.Lal
- 26 : Practical Zoology Vertebrate..... S.S.Lal



विद्या परमं बलम्

SURENDRANAGAR
UNIVERSITY

SURENDRANAGAR

SCHOOL OF SCIENCE

[Three Years (6 Semesters) Full Time Course]

ZOOLOGY SYLLABUS
WITH EXAMINATION CODING SYSTEM

2022 - 23

Surendranagar University

Kothariya Road, Surendranagar –Gujarat,

विद्या परमं बलम्

EXAMINATION CODING SYSTEM

Sr. No.	Name Of Programme	B.Sc. ZOOLOGY			
1	Title Of Paper	(In Sem -III) Non Chordate : Systematic, Forms & Functions, Cell Biology & Genetics, Animal Behaviour & Embryology, & Evolution	(In Sem -IV) Chordate: Systematic, Forms & Functions, Physiology & Histology, Wild life Biology & Ecology, Entomology & Fisheries Biology		
2	Theory Credit	4		4	
3	Practical Credit	3		3	
4	Total Credit	7		7	
5	External Marks Of Theory	70		70	
6	Internal Marks Of Theory	30		30	
7	Total Marks Of Theory	100		100	
8	External Marks Of Practical	35		35	
9	Internal Marks Of Practical	15		15	
10	Total Marks Of Practical	50		50	
11	Grand Total	150		150	
12	External Exam Time Duration	2½ Hours		2½ Hours	
Course/ Paper Code					
13	Year	1	7	1	7
14	Faculty	0	3	0	3
15	Subject	0	4	0	4
16	UG/PG	0	1	0	1
17	Semester	0	3	0	4
18	Paper	0	3	0	4
19	Core	0	0	0	0

SURENDRANAGAR
UNIVERSITY
SURENDRANAGAR

ZOOLOGY
SYLLABUS

WITH EXAMINATION CODING SYSTEM

19-03-04-01-03-03-00

19-03-04-01-04-04-00

[SYLLABUS FOR THE CHOICE BASED CREDIT SYSTEM (CBCS)]

(S.Y. B.Sc.)

**SEMESTER III – PAPER – Z-03 &
SEMESTER IV – PAPER – Z-04**

**Revised Syllabus
INFORCE FORM JUNE – 2022**

विद्या परमं बलम्

SURENDRANAGAR UNIVERSITY
SURENDRANAGAR

[SYLLABUS FOR CHOICE BASED CRADIT SYSTEM (CBCS)]

INFORCE FORM JUNE – 2022

SUBJECT: ZOOLOGY

WITH EXAMINATION CODING SYSTEM

19-03-04-01-03-03-00 19-03-04-01-04-04-00

SEMESTER – III

ZOOLOGY PAPER – Z *– 03

**Non Chordate : Systematic, Forms & Functions, Cell Biology & Genetics,
Animal Behaviour & Embryology & Evolution**

SEMESTER – IV

ZOOLOGY PAPER – Z – 04

**Chordate: Systematic, Forms & Functions, Physiology & Histology, Wild life
Biology & Ecology & Entomology & Fisheries Biology**

विद्या परमं बलम्

SURENDRANAGAR UNIVERSITY

SURENDRANAGAR

(CBCS Syllabus)

SEMESTER – III

ZOOLOGY

19-03-04-01-03-03-00

PAPER – Z-03

Non Chordate : Systematic, Forms & Functions, Cell Biology & Genetics,
Animal Behaviour & Embryology, & Evolution

UNIT – 1: SYSTEMATIC

Salient feature & classification up to classes in Non-chordates, structural organization in different phylum of Non-chordates with examples. Phylum- Protozoa, Porifera, Coelenterata, Platyhelminthes, Aschelminthes, Annelida, Arthropoda, Mollusca, Echinodermata, Hemichordata.

UNIT – 2: FORMS AND FUNCTIONS IN ANIMALS

2.1 General structures and morphology with functional anatomy of following type

ANNELIDA: Type Study: Leech

2.2 ARTHROPODA:

(i) Different type of Mouth parts in Insects.

1. Chewing & Biting Type – Cockroach
2. Chewing & Lapping Type – Honey Bee
3. Piercing & Sucking Type – Mosquito
4. Sponging Type – Housefly
5. Siphoning Type – Butterfly

UNIT – 3: CELL BIOLOGY AND GENETICS:

3.1 CELL BIOLOGY: Only Structure and Function of following organelles.

- (i) Golgi Complex
- (ii) Ribosome

- (iii) Lysosome
- (iv) Centrioles & Basal Bodies

3.2 GENETICS:

- (i) Structure of Chromosome
- (ii) Types of Chromosome according to Centromere
- (iii) Human Chromosome and Karyotyping
- (iv) Cytoplasmic inheritance
- (v) Sex Determination in Drosophila, Human being and Bonelia

UNIT – 4: ANIMAL BEHAVIOUR & EMBRYOLOGY:

4.1 Social Behaviour:

- (i) Honey bee
- (ii) Termite

4.2 Courtship & Reproductive Behaviour:

- (i) Spider
- (ii) Scorpion (iii) Peacock

4.3 Parental Care Behaviour:

- (i) Arius
- (ii) Ichthyophis
- (iii) Alytes
- (iv) Hornbill

4.4 EMBRYOLOGY:

- (i) Types of Eggs according to yolk.
- (ii) Types of Cleavage

UNIT-5: EVOLUTION

5.1 EVOLUTION:

- (i) Introduction to Evolutionary Theories: Lamarckism, Darwinism, Neodarwinism
- (ii) Origin and Evolution of Earth
 - (iii) Isolation
 - (iv) Speciation
- (V) Morphological & Comparative anatomy of Homologous and Analogous Organs

PRACTICALS RELATED TO PAPER – Z-03

Practical: 1 :Identification and classification of Invertebrate animals

- (i) Phylum: Protozoa : Noctiluca, Amoeba, Plasmodium, Opalina, Paramecium
- (ii) Phylum: Porifera : Grantia, Hyalonema, Chalina

Practical: 2 :Identification and Classification of Invertebrate animals.

- (i) Phylum: Coelenterata : Obelia, Aurelia, Gorgonia
- (ii) Phylum: Platyhelminthes : Bipalium, Schistosoma, MonieziaExpansa
- (iii) Phylum; Aschelminthes : Enterobius vermicularis, Filarial worm, Guinea worm

Practical: 3 :Identification and Classification of Invertebrate animals

- (i) Phylum: Annelida : Nereis, Lumbricus, Pontobdella,
- (ii) Phylum : Arthropoda :- Peripatus, Prawn, Centipede, Grasshopper, Spider, Limulus

Practical: 4 :Identification and Classification of Invertebrate animals

- (i) Phylum: Mollusca : - Chaetoderma, Mytilus, Aplysia, Dentelium, Loligo
- (ii) Phylum: Echinodermata: Anthena (Star fish), Ophiocoma (Brittle Star), Echinocardium (Heart urchin), Holothuria (Sea Cucumber), Antedon (Feather Star)
- (iii) Phylum : Hemichordata : Saccoglossus, Rhabdopleura

Practical: 5 :To Study Systems of Leech:

- (i) External Characters
- (ii) Digestive System
- (iii) Nervous System
- (iv) Reproductive System - By chart or Multimedia

Practical: 6 :To Study Mounting of Leech:

- (i) Jaws
- (ii) Salivary Gland
- (iii) Nephridia
- (iv) Ovary - By chart or Multimedia or Slide

Practical: 7 :To Study Mouthparts of Insects:

- (i) Chewing &Bitting Type – Cockroach

- (ii) Chewing & Lapping Type – Honey Bee
- (iii) Piercing & Sucking Type – Mosquito
- (iv) Sponging Type – Housefly
- (v) Siphoning Type – Butterfly

Practical: 8 :To Study Cell Organelles:

- (i) Golgi Complex
- (ii) Ribosome
- (iii) Lysosome
- (iv) Centrioles & Basal Bodies

Practical: 9 : To study types of Chromosomes according to Centromere.

Practical: 10 :To Study Human Chromosome & Its Karyotyping.

Practical: 11 : To study Sex determination in drosophila and human

Practical: 12 :To Study Animal Behaviours:

1. Social Behaviour:

- (i) Honeybee (ii) Termite

2. Courtship & Reproductive Behaviour:

- (i) Spider (ii) Scorpion (iii) Peacock

3. Parental Care Behaviour:

- (i) Arius
- (ii) Ichthyophis
- (iii) Alytes
- (iv) Hornbill

Practical: 13 : To study types of eggs according to Yolk.

Practical: 14 :To study types of Cleavage.

Practical: 15 : To Study Haemologous&Analogous organs.

Practical: 16 :Visit to any one National Park or Sanctuary OR Reserve forest area OR Skilled based Educational programme/Lecture .

DISTRIBUTION OF UNITS

19-03-04-01-03-03-00

SEMESTER – III

<u>PAPER – Z-03</u>			
Unit No.	Unit Title	Theory Period	Marks.
Unit : 1	Systematic	12	14
Unit : 2	Forms and Functions	12	14
Unit : 3	Cell Biology and Genetics	18	14
Unit : 4	Animal behaviour & Embryology	15	14
Unit : 5	Evolution	13	14
TOTAL :		70	70

- Above statement concerned to only Theory portion of the paper.
- Above mentioned third column ‘Theory Period’ indicates total number of theory lectures per unit.
- Total syllabus should be completed within 65 theory lectures.
- Each and every units are carries equal 14 marks.
- Total marks for theory examination are 70 marks.
- **PAPER SETTER MUST FOLLOW THE UNIT WISEMARK SETUP.**

SURENDRANAGAR UNIVERSITY
SURENDRANAGAR
THEORY EXAMINATION

SEMESTER – III

ZOOLOGY

19-03-04-01-03-03-00

(Based on Paper – Z-03)

Time: 2½ Hours

Total Marks: 70

Instructions:

1. Illustrate your answer with neat and labeled diagram.
2. Figure to the right side indicates full marks of questions.

QUESTION-1 (THIS QUESTION IS TAKEN FROM UNIT-1)

QUESTION-2 (THIS QUESTION IS TAKEN FROM UNIT-2)

QUESTION-3 (THIS QUESTION IS TAKEN FROM UNIT-3)

QUESTION-4 (THIS QUESTION IS TAKEN FROM UNIT-4)

QUESTION-5 (THIS QUESTION IS TAKEN FROM UNIT-5)

- ANY TYPE OF MCQs IS NOT INCLUDED IN THIS PAPER STYLE.

- EACH QUESTION CARRIES EQUAL MARKS – 14.

- THERE ARE 5 QUESTIONS CONTAINING SUBQUESTIONS (A), (B), (C), (D).

QUESTION-1: (From UNIT-1)

[14]

(A) Give the answer of following questions.

[04]

Only short questions, Definitions and Fill in the blanks and NOT INCLUDED MCQs.

Each Question carries 1 Marks.

(1)

(2)

(3)

(4)

(B) Write any one out of Two.

[02]

Each Question carries 2 Marks.

(1)

(2)

(C) Write any one out of Two.

[03]

Each Question carries 3 Marks.

(1)

(2)

(D) Write any one out of Two.

[05]

Each Question carries 5 Marks.

(1)

(2)

QUESTION-2: (As Above) (From UNIT-2)

[14]

QUESTION-3: (As Above) (From UNIT-3)

[14]

QUESTION-4: (As Above) (From UNIT-4)

[14]

QUESTION-5: (As Above) (From UNIT-5)

[14]

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PRACTICAL EXAMINATION

SEMESTER – III

ZOOLOGY

19-03-04-01-03-03-00

(Based on Paper – Z-03)

Time: 3 Hours

Total Marks: 35

Que -1: Sketch and label _____ system of Leech. [06]

Que – 2: Sketch and label /Mountings of Leech _____.

(Practical-6)

[03]

Que – 3: Do as per instruction and show it to examiner

[03]

(Practical – 8)

Que – 4: Do as per instruction and show it to examiner

[03]

(Practical – 09,10& 11)

Que – 5: Write as per instruction. [14]

(A) Identify and classify giving reasons.

(Lower invertebrate, Practical- 1&2)

(B) Identify and classify giving reasons.

(Higher invertebrate, Practical – 3&4)

(c) Identify and describe. (Practical- 7)

(D) Identify and describe. (Practical-12)

(E) Identify and describe (Practical-13)

(F) Identify and describe (Practical-14)

(G) Identify and describe (Practical-15)

Que. – 5: Viva-voice/Tour report.

[03]

Que – 6: Certified Journal.

[03]

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**List of Slides, Specimens, Charts, Models &
Photographs**

SEMESTER – III

ZOOLOGY

19-03-04-01-03-03-00

(Based on Paper – Z-03)

LIST OF SLIDES:

- (1) All animals from Protozoa. [Practical-1, (i)]
- (2) Obelia, Schistosoma, Enterobiusvermicularis, Filaria worm [Practical-2, (i), (ii), (iii)]
- (3) Mountings of Leech [Practical-6]
- (4) Mouth Parts of Insects. [Practical-7]
- (5) Termite [Practical-12, (i)]
- (6) Types of eggs according to Yolk [Practical – 13]
- (7) Types of Cleavage. [Practical – 14]

LIST OF SPECIMENS:

- (1) All animal specimens from Phylum- Porifera to Phylum-Hemichordata. [Practical-1 to Practical-4, except Practical-1, (i) & Obelia, Schistosoma, Enterobiusvermicularis, Filariaworm]
- (2) Animal Behaviour

LIST OF CHARTS/MODELS/PHOTOGRAPHS:

- (1) Systems of Leech. [Practical-5]
- (2) Cell Organelles. [Practical-8]
- (3) Evolution chart [Practical-15]
- (4) Genetics chart [Practical-9 to 11]

REFERENCE BOOKS

19-03-04-01-03-03-00

SEMESTER – III

List of books For Unit-1 & 2

- 1 : Invertebrate Zoology E.L.Jordan&Dr.P.S.Verma
- 2 : Invertebrate Zoology.....P.S.Dhami&J.K.Dhami. 3
- : A modern textbook of Zoology Invertebrate Zoology R.L.Kotpal.
- 4 : A textbook of Practical Zoology-
Invertebrates S.S.Lal
- 5 : Kotpal Series –
Porifera R.L.Kotpal
- 6 : Kotpal Series –
Annelida..... R.L.Kotpal
- 7 : Kotpal Series –
Arthropoda..... R.L.Kotpal
- 8 : A Manual of Practical Zoology,
Invertebrates P.S.Verma

List of books For Unit-3

- 9 : Cell Biology Dr.Satyeshchandra
Roy.
- 10 : Cell
Biology C.B.Power
- 11 : Cytology &
Genetics P.K.Gupta
- 12 : Cell & Molecular Biology De
Robertis.
- 13 : Biotechnological Cell Biology..... V.B.Rastogi. 14
- : Molecular Biology..... V.B.Rastogi 15
- : Histology..... Atlas.
- 16 : Cell Biology, Genetics, Molecular Biology, Evolution and
Ecology P.S.Varma&V.K.Agrawal.
- 17 : Cytology..... P.S.Verma&V.K.Aggarwal
- 18 : Cytology, Genetics & Evolution P.K.Gupta

List of books for Unit- 4 & 5

- 19 : Wild Life of Gujarat H.S.Singh.
- 20 : Applied ZoologyN
Arumugam
- 21 : Applied ZoologyNagendra S Pawar
- 22 : Applied Entomology P G Fenemore
- 23 : Indian National Parks and Sanctuaries Khati&Annand S.
- 24 : Modern textbook of Zoology
Vertebrates.....R.L.Kotpal25 : Vertebrate
Zoology..... E.L.Jordan&Dr.P.S.Verma
- 26 :Practical Zoology Vertebrate.....S.S.Lal27
:Ecology & Environmental biology P.D.Sharma.
- 28 : Cell Biology, Genetics, Molecular Biology, Evolution and
Ecology P.S.Varma&V.K.Agrawal.
- 29 : Fundamentals of Ecology.....Odum E.P. & Barrett G.W. 30
: Basic Concepts of Ecology.....A. Arumugam31
: Elements of EcologyRobert & Thomas.
- 32 : Environmental BiologyP.S.Verma&V.K.Aggrwal

List of Books for Viva-Voices

- 33 : Practical Zoology Invertebrate S.S.Lal
- 34 : Practical Zoology Vertebrate.....S.S.Lal

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**SURENDRANAGAR
UNIVERSITY**
SURENDRANAGAR
(CBCS Syllabus)
SEMESTER - IV 19-03-04-01-04-04-00
PAPER – Z-04
ZOOLOGY

Chordate: Systematic, Forms & Functions, Physiology & Histology, Wild life
Biology & Ecology & Entomology & Fisheries Biology

UNIT- 1: SYSTEMATIC:

1.1 Salient features and classification up to class in Chordates with examples.

UNIT- 2: FORMS AND FUNCTIONS IN ANIMALS::

2.1 General structure and morphology with functional anatomy of following type.

REPTILE: Type Study – Calotes

2.2 Difference between Poisonous & Non-Poisonous snakes.

2.3 Snake bite, Anti-Venom, Preventive measures and First aid Treatment.

UNIT- 3: PHYSIOLOGY & HISTOLOGY

3.1 EXCRETION:

- (i) Nitrogenous Waste
- (ii) Structure of Nephron
- (iii) Formation of Urine
- (iv) Control of Renal Function

3.2 HISTOLOGY:

Histological structure and function of following organs of Mammals.

- (i) Pituitary
- (ii) Thyroid
- (iii) Spleen
- (iv) Lung

UNIT- 4: WILD LIFE BIOLOGY & ECOLOGY

5.1 Wild-life in Gujarat:

- (I) NATIONAL PARKS: (i) Vansda National Park
(ii) Velavadar National Park
- (II) SANCTUARIES: (i) Ratanmahal Sloth bear Sanctuary
(ii) Shoolpaneshwar Wild life Sanctuary

5.2 Household Insects:

- (i) Insect affecting Human health: 1. Tse-Tse Fly, 2. House Fly, 3. Mosquito
(ii) Insect damaging Household Goods: 1. Termite, 2. Silver Fish, 3. Cricket

5.3 Ecology:

- (i) Energy Flow in Eco-system
(ii) Ecological pyramids

UNIT – 5: FISHERIES BIOLOGY

- 5.1 Introduction of fish morphology
5.2 Difference between Chondrichthyes and Osteichthyes
5.3 Scales in fishes
5.4 Fins in fishes
5.5 Some fishes of saurashtra sea coast
- (i) Pomfret
 - (ii) Bombayduck
 - (iii) Prawn
 - (iv) Lobster
 - (v) Pearl Oyster

विद्या परमं बलम्

PRACTICALS RELATED ON PAPER – Z-04

Practical: 1 :Identification and classification of Chordate animals.

- (i) Sub-Phylum : Urochordata : Ascidia, Doliolum, Oikopleura
- (ii) Sub-Phylum: Cephalochordata : Amphioxus
- (iii) Class: Cyclostomata : Myxine
- (iv) Super Class: Pisces : Tiger-Shark, Pristis, Trygon, Acipensor, Labeo, Protopterus

Practical: 2 :Identification and classification of Chordate animals.

- (i) Class: Amphibia : Uraeotyphlus, Siren, Axolotal Larva, Rhacophorus, Hyla
- (ii) Class : Reptiles : Testudo, Sphegnodon, Phrynosoma, Cobra, Crocodylus(Mugger), Gavialis(Gharial), Ophiosaurus

Practical: 3 :

- (i) Class: Aves : Pigeon, Flamingo, Duck, Crow, Ostrich
- (ii) Class : Mammal : Spiny Anteater, Loris, Shrew, Rhesus Monkey

Practical: 4 :To Study systems of Calotes :

- (i) External Characters
- (ii) Digestive System
- (iii) Arterial System
- (iv) Venous System
- (v) Urinogenital System
- (vi) Brain
 - Through chart or Multimedia

Practical: 5 :To Study Mountings of Calotes:

- (i) Pecten
- (ii) Blood
- (iii) Striated Muscle

Practical: 6 :To Study difference between Poisonous & Non-Poisonous Snakes.:

-By charts or Multimedia.

Practical: 7 :To Study following Poisonous & Non-Poisonous Snakes.

1. Rat Snake, 2. Python, 3. Sand Boa, 4. Hydrophis, 5. King Cobra, 6. Cobra, 7. Krait, 8. Russell's Viper, 9. Echiscarinata

Practical: 8 :To Study Histological Structure of Mammalian Organs:

- (i) Pituitary
- (ii) Thyroid
- (iii) Adrenal
- (iv) Kidney

Practical: 9 :To Study National Parks and Sanctuaries of India(Location in map):

- (i) Vansda National Park
- (ii) Velavadar National Park
- (iii) Ratanmahal Sloth bear Sanctuary
- (iv) Shoolpaneshwar Wild life Sanctuary

Practical: 10: To study Household insects (Part I)

Insect affecting Human health: 1. Tse-Tse Fly, 2. House Fly, 3. Mosquito

Practical: 11: To study Household insects (Part II)

Insect damaging Household Goods: 1. Termite, 2. Silver Fish, 3. Cricket

Practical: 12 : Fisheries Biology:

- (i) Difference between Chondrichthyes and Osteichthyes
- (ii) Scales in fishes
- (iii) Fins in fishes

Practical: 13 : To study different types boats and nets:

Practical: 14 : To study of Important fisheries:

- (i) Pomfret
- (ii) Bombayduck
- (iii) Prawn
- (iv) Lobster (v) Pearl Oyster

Practical: 15 : Visit to any one National Park or Sanctuary OR Reserve forest area OR Skilled based Educational programme/Lecture OR visit local education centers.

DISTRIBUTION OF UNITS

19-03-04-01-04-04-00

SEMESTER – IV

PAPER – Z-04			
Unit No.	Unit Title	Theory Period	Marks.
Unit : 1	Systematic	12	14
Unit : 2	Forms and Functions	15	14
Unit : 3	Physiology & Histology	14	14
Unit : 4	Wild life biology, Ecology & Entomology	15	14
Unit : 5	Fisheries Biology	14	14
TOTAL :		70	70

- Above statement concerned to only Theory portion of the paper.
- Above mentioned third column ‘Theory Period’ indicates total number of theory lectures per unit.
- Total syllabus should be completed within 70 theory lectures.
- Each and every units are carries equal 14 marks.
- Total marks for theory examination are 70 marks.
- **PAPER SETTER MUST FOLLOW THE UNIT WISEMARK SETUPS.**

SURENDRANAGAR UNIVERSITY

SURENDRANAGAR

THEORY EXAMINATION

SEMESTER – IV

ZOOLOGY

19-03-04-01-04-04-00

(Based on Paper – Z-04)

Time: 2½ Hours

Total Marks: 70

Instructions:

1. Illustrate your answer with neat and labeled diagram.
2. Figure to the right side indicates full marks of questions.

QUESTION-1 (THIS QUESTION IS TAKEN FROM UNIT-1)

QUESTION-2 (THIS QUESTION IS TAKEN FROM UNIT-2)

QUESTION-3 (THIS QUESTION IS TAKEN FROM UNIT-3)

QUESTION-4 (THIS QUESTION IS TAKEN FROM UNIT-4)

QUESTION-5 (THIS QUESTION IS TAKEN FROM UNIT-5)

- ANY TYPE OF MCQs IS NOT INCLUDED IN THIS PAPER STYLE.

- EACH QUESTION CARRIES EQUAL MARKS – 14.

- THERE ARE 5 QUESTIONS CONTAINING SUBQUESTIONS (A), (B), (C), (D).

QUESTION-1: (From UNIT-1)

[14]

(A) Give the answer of following questions.

[04]

Only short questions, Definitions and Fill in the blanks and NOT INCLUDED MCQs.

Each Question carries 1 Marks.

(1)

(2)

(3)

(4)

(B) Write any one out of Two.

[02]

Each Question carries 2 Marks.

(1)

(2)

(C) Write any one out of Two.

[03]

Each Question carries 3 Marks.

(1)

(2)

(D) Write any one out of Two.

[05]

Each Question carries 5 Marks.

(1)

(2)

QUESTION-2: (As Above) (From UNIT-2)

[14]

QUESTION-3: (As Above) (From UNIT-3)

[14]

QUESTION-4: (As Above) (From UNIT-4)

[14]

QUESTION-5: (As Above) (From UNIT-5)

[14]

SURENDRANAGAR UNIVERSITY
SURENDRANAGAR
PRACTICAL EXAMINATION

SEMESTER – IV

ZOOLOGY

19-03-04-01-04-04-00

(Based on Paper – Z-04)

Time :3 Hours

Total Marks : 35

Que – 1 : Sketch and label _____ system of Calotes. [05]

(Practical-4)

Que – 2 : Sketch and label /Mounting of Calotes _____

(Practical-5)

[03]

Que – 3 : Do as per instruction and show it to examiner

(Practical- 12)

[03]

Que – 4: Do as per instruction and show it to examiner

[03]

(Practical –13)

Que – 5 : Write as per instruction.

[12]

- (A) Identify and classify giving reasons.(Lower chordate)
- (B) Identify and classify giving reasons. (Higher Chordate)
- (C) Identify and describe. (Practical-6/7)
- (D) Identify and describe. (Practical- 8/9)
- (E) Identify and describe. (Practical- 10/11)
- (F) Identify and describe. (Practical-14)

Que – 6 : Tour report [03]

Que – 7 : Viva – voice. [03]

Que – 8 : Certified Journal. [03]

SURENDRANAGAR UNIVERSITY
SURENDRANAGAR

**List of Slides, Specimens, Charts, Models &
Photographs**

SEMESTER – IV

ZOOLOGY

19-03-04-01-04-04-00

(Based on Paper – Z-04)

LIST OF SLIDES:

- (1) Doliolum, Oikopleura [Practical-1,(i)]
- (2) Mountings [Practical-5], Also available in Chart.
- (3) Histological Structure of mammalian organs. [Practical-9]
- (4)

LIST OF SPECIMENS:

- (1) All animal specimens from Sub-Phylum-Hemi Chordata to Class- Mammals.
[Practical-1&2 except Doliolum&Oikopleura]
- (2) Snakes [Practical-8]
- (3) Fisheries [Practical-17]

LIST OF CHARTS/MODELS/PHOTOGRAPHS:

- (1) Systems of Calotes [Practical-4]
- (2) National Parks & Sanctuaries of Gujarat State. [Practical-13 & 14]
- (3)

विद्या परमं बलम्

REFERENCE BOOKS

19-03-04-01-04-04-00

SEMESTER – IV

List of Books for Unit -1 & 2

- 1 : Chordate Zoology..... E.L.Jordan&Dr.P.S.Verma2
- : Modern textbook of Zoology Vertebrates.....R.L.Kotpal.
- 3 : Chordate Embryology P.S.Verma&V.K.Agraval
- 4 : A manual of practical Zoology, Vertebrates P.S.Verma
- 5 : Practical Zoology, Vertebrates S.S.Lal

List of Books for Unit - 3

- 6 : Animal Physiology..... P.K.Gupta.
- 7 : Animal
Physiology V.K.Agrawal.
- 8 : Animal
Physiology..... M.P.Arora
- 9 : A textbook of Animal
Physiology.....TyagiPrasum
- 10 : Human Physiology,
Vol- I & II.....Chatterjee C.C.
- 11 : A text book of
Animal Physiology..... A.K.Berry&K.Berry
- 12 : Animal Physiology & Bio-Chemistry R.A.Aggrawal&
Anil k. Shrivastva&Kaushal Kumar
- 13 : Chordate Embryology P.S.Verma&V.K.Agraval

List of Books for Unit – 4

- 14 : Principle of Genetics Gardner.
- 15 : Genetics..... P.S.Varma&V.K.Agrawal.
- 16 : Problems on Genetics, Molecular Genetics & Evolutionary Genetics....
.....Dr.P.K.Banerjee.
- 17 : Genetics & Biostatistics Meyyan.
- 18 : Cell Biology, Genetics, Molecular Biology, Evolution&
Ecology P.S.Verma&V.K.Agarwal.

19 : Cytology, Genetics & EvolutionP.K.Gupta

List of Books for Unit – 5

20 :Organic Evolution..... Dr. N. Arumugam.

21 :Evolution..... VeerbalaRastogi.

22 :Chordate Zoology.....E.L.Jordan&Dr.P.S.Verma23 :

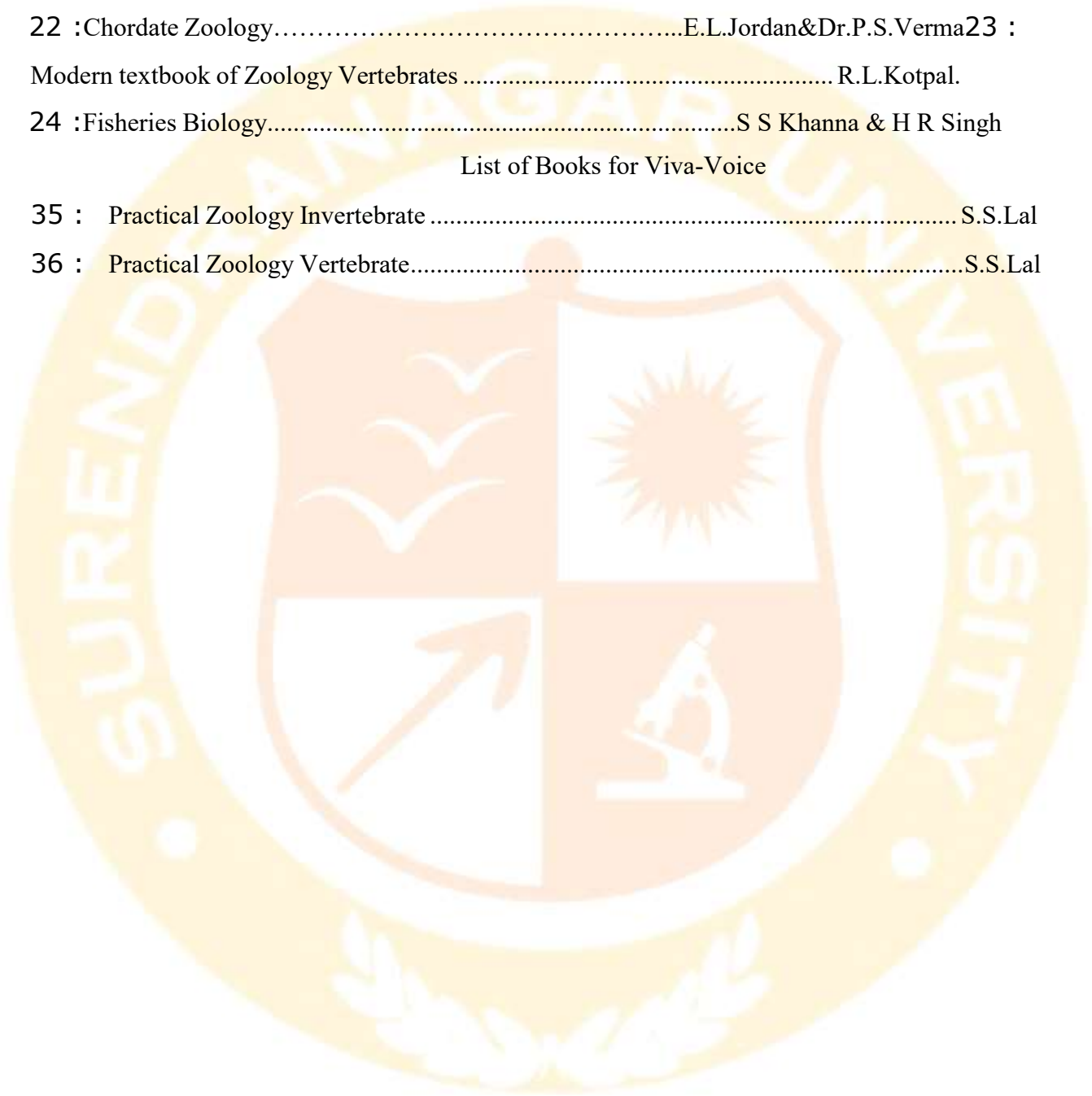
Modern textbook of Zoology Vertebrates R.L.Kotpal.

24 :Fisheries Biology.....S S Khanna & H R Singh

List of Books for Viva-Voice

35 : Practical Zoology Invertebrate S.S.Lal

36 : Practical Zoology Vertebrate.....S.S.Lal



विद्या परमं बलम्

SURENDRANAGAR UNIVERSITY, SURENDRANAGAR

**Revised syllabus of B.Sc. Semester V and VI Zoology as per UG guidelines
Effective from June 2022**

This curriculum consists of six theory papers and six practicals. Syllabus has been divided in to two semesters (i.e. semester – V and VI). Students have to study three papers in each semester and three practicals based on theory papers. The course is to be completed by assigning six periods for each theory and six periods for each practical per week. Practical periods are inclusive to field study.

Paper No.-501: Functional Anatomy of Non-chordates

**Paper No.-502: Fisheries biology, Animal Husbandry, Bioinstrumentation,
Toxicology, Biostatistics**

**Paper No.-503: Biochemistry I, Biochemistry II Cytology, Genetics,
Fundamental Processes**

Paper No.-601: Functional Anatomy of Chordates and comparative study

**Paper No.-602: Cardiovascular system, Respiration and Muscular System,
Endocrinology and Reproduction, Immunology and Sense
Organ and Histology**

**Paper No. - 603: Reproductive physiology and Embryology, Developmental
biology, Wild life, Ecology & Environmental pollution, Evolution**

Pattern of Examination:

There should be two internal exams per semester. An average 10 marks should be given for internal exams and that marks will be included in final aggregate results of the semester. Besides internal examination there are two assignments of the subjects to be submitted by the students. 10 marks for assignments, 10 marks for test, 5 mark for attendance and 5 marks for quiz will be added to the final results of the semester. Total 30 marks are internally assessed and 70 marks for external (University Exams) exams, per paper. A student's performance in every practical session is assessed and marks for a maximum of 15 is given. External practical evaluation will carry 35 marks, so total 50 marks for each practical per paper examination will be counted. The pattern of semester exam will be as follows.

Sr. No.	Name Of Programme	B.Sc. ZOOLOGY Semester-5		
		501	502	503
1	Theory credit	4	4	4
2	Practical credit	3	3	3
3	Project credit	3		
4	Total credit	24		
5	External marks of theory	70	70	70
6	Internal marks of theory	30	30	30
7	Total marks of theory	100	100	100
8	External marks of Practical	35	35	35
9	Internal marks of theory	15	15	15
10	Total marks of practical	50	50	50
11	Grand total	150	150	150
12	External examination time duration	2.30 hrs	2.30 hrs	2.30 hrs

Sr. No.	Name Of Programme	B.Sc. ZOOLOGY Semester-6		
		601	602	603
1	Theory credit	4	4	4
2	Practical credit	3	3	3
3	Project credit	3		
4	Total credit	24		
5	External marks of theory	70	70	70
6	Internal marks of theory	30	30	30
7	Total marks of theory	100	100	100
8	External marks of Practical	35	35	35
9	Internal marks of theory	15	15	15
10	Total marks of practical	50	50	50
11	Grand total	150	150	150
12	External examination time duration	2.30 hrs	2.30 hrs	2.30 hrs

SURENDRANAGAR UNIVERSITY, SURENDRANAGAR

B.Sc. Semester-VI
Zoology
Practical exam- Project
Marking scheme of project Total marks: 100

1. Selection of the topic and project title	10
2. Introduction	10
3. Review of literature	05
4. Aims and objective	10
5. Methodology	10
6. Result and discussion	20
7. Conclusion	10
8. References	05
9. Viva	20

**SKELETON OF QUESTION PAPER FOR
THEORY PAPERS
(EXTERNAL EXAMS)**

**SAURASHTRA UNIVERSITY - RAJKOT
THEORY EXAMINATION
SEMESTER – V and VI
ZOOLOGY**

(Based on Paper – Z-501 to 603)

Time: 2½ Hours

Total Marks: 70

Instructions:

1. Illustrate your answer with neat and labelled diagram. 2. Figure to the right side indicates full marks of questions.

QUESTION-1 (THIS QUESTION IS TAKEN FROM UNIT-1)

QUESTION-2 (THIS QUESTION IS TAKEN FROM UNIT-2)

QUESTION-3 (THIS QUESTION IS TAKEN FROM UNIT-3)

QUESTION-4 (THIS QUESTION IS TAKEN FROM UNIT-4)

QUESTION-5 (THIS QUESTION IS TAKEN FROM UNIT-5)-

**ANY TYPE OF MCQs IS NOT INCLUDED IN THIS PAPER
STYLE.**

- EACH QUESTION CARRIES EQUAL MARKS – 14. -

THERE ARE 5 QUESTIONS CONTAINING SUBQUESTIONS

(A), (B), (C), (D).

B.Sc. Semester V

Zoology Syllabus

Paper-Z-501

Functional Anatomy of Non-chordates

Unit-1 Systematic

Salient feature and outline classification up to classes in non-chordates with examples.

Unit-2 Forms and Functions in Animals

2.1 General structures and morphology with functional anatomy of following type.

Type animal with classification up to order

[A] Phylum : Arthropoda - Type study- Scorpion

[1] External features [2] Digestive system

[3] Nervous system [4] Reproductive system (Male and Female)

[5] Book lungs [6] Pecten [7] All appendages

[B] Phylum : Mollusca - Type study- Sepia

[1] External features [2] Digestive system

[3] Nervous System [4] Ink-Gland

Unit-3 Invertebrate Part I (Protozoa to coelenterates)

3.1 Protozoa: Nutrition, locomotion, reproduction

General account of Protozoa and human diseases :

(i) Leshmania - Leshmaniasis

(ii) Giardia- Diarrhoea

(iii) Plasmodium - Malaria

3.2 Porifera: Skeleton, canal system, Reproduction and sponge industry

3.3 Coelenterata: Coral, coral reefs and polymorphism

Unit -4 Invertebrate Part II (Platyhelminthes to Arthropoda)

4.1 Platyhelminthes: Parasitic adaptation with reference to Fasciola

4.2 Aschelminthes: Parasites nematodes of man with reference to diagnostic characters mode of infection and disease caused (Trichinella Spiralis, Ancylostoma (Hook worm), Ascaris

4.3 Annelida: Metamerism and its significance

4.4 Arthropoda: Larval forms of Crustacea (Nauplius, Meta nauplius, Zoea, Mysis, Megalopa), Metamorphosis in insects and Zoological importance of Peripatus.

Unit-5 Invertebrate Part III (Mollusca to Hemichordate)

5.1 Mollusca: Foot in Mollusca, Torsion and Detorsion.

5.2 Echinodermata: Larval forms, water vascular system

5.3 Hemichordata: Affinities (Balanoglossus), Tornaria larvae

B.Sc. Semester-V
Zoology Practical Syllabus
Practical -1
Based on Paper-Z-501

Unit-1 Identification and classification up to order

Protozoa: Euglena, Trichomonas, Entamoeba, Giardia, Actinospherium, Leishmania.

Porifera: Sycon, Pheronema, Spongilla.

Coelentrata: Valella, Tubularia, Aurelia, Corallium (Red Coral), Pennatula (Sea Pen),
Fungia (Mushroom coral), Leucemaria, Haliclystus

Platyhelminthes: Liver fluke

Aschelminthes: Trichinella spiralis, Ancylostoma, oxyuris

Annelida: Chaetopterus, Tubifex, Bonelia, Acanthobdella.

Arthropoda: Apus, Balanus, Hermit Crab, Lepisma, Pediculus, Forficula, Nepa,
Musca domestica, Wasp, Butterfly.

Mollusca: Murex, Aplysia, Doris, Teredo, Eolis, Pinctada vulgaris.

Echinodermata: Anthenea, Luidia, Echinocardium

Hemichordata: Balanoglossus

Unit 2: Dissection and Temporary mountings.

Scorpion

[1] External features [2] Digestive system

[3] Nervous system [4] Reproductive system (Male and Female)

Sepia:

[1] External features [2] Digestive system

[3] Nervous System

Mounting:

Part I Scorpion [1] Book lungs [2] Pecten [3] All appendages

Part II Sepia [1] Ink-Gland

Part III Star fish [1] Tube feet

Unit 3: Preparation from preservative material

Protozoa: Vorticella.

Porifera: Sponge Spicules and gemmules.

Coelenterata : Hydra with bud.

Unit 4 A study of permanent slides and important specimens.

Part 1 Conjugation in paramecium, Obelia hydranth in L.S., Obeliagonagium, T.S. of Leech.

Part 2 (a) Nauplius larvae, Metanapleus larvae, Zoea larvae, Mysis larvae, Megalopa larvae,

(b) Life cycle of butter fly (egg, larva, pupa and adult).

Unit 5 A study of permanent slides and important specimens.

Part 3 (a) Bipinnaria larvae, Ophiopluteus larvae, Echinopluteus larvae and water vascular system of antedon

(b) T.S. of Balanoglossus through proboscis, T.S. through oesophageal region.

PRACTICAL INDEX

Practical no 1 Based on PaperZ-501

- (1) Classification of Protozoa to Coelenterates
- (2) Classification of Platyhelminthes to Annelida
- (3) Classification of Arthropod& Mollusca
- (4) Classification of Echinodermata & Hemichordata
- (5) To study external features and digestive system of scorpion
- (6) To study nervous system and reproductive system of scorpion
- (7) To study mounting of pecten, of book-lung and all appendages of scorpion
- (8) To study external feature and water vascular system of star-fish
- (9) To study external features and digestive system of sepia
- (10) To study nervous system of sepia
- (11) To study mounting of Ink-Gland of sepia and Tube feet of Star fish
- (12) Preparation from preservative material- Protozoa to coelenterate
- (13) A study of permanent slide and important specimen-Part I
- (14) A study of permanent slide and important specimen-Part II
- (15) A study of permanent slide and important specimen-Part III

A list of references books of Paper-501

- (1)The invertebrate vol.1&2 --Hyman, L.H.(Mc Graw Hill)
- (2)Invertebrate zoology -- Barbes, R.D. (W.B. SaundersCo)
- (3)Invertebrate zoology --Jordan E.L. &P.S.Verma (S.Chand&Co)
- (4) A text book of zoology vol 1 & 2 --Parker &Hswell
- (5) A text book of zoology vol 1 & 2 --Mujupuria& others
- (6)Invertebrate zoology --R.L.Kotpal
- (7)Invertebrate zoology --E.L.Jordan
- (8)Invertebrate zoology --Dr.S.N.Prasad
- (9)Invertebrate structure & function --Barrington
- (10)Invertebrate zoology --Barnes llll
- (12) A textbook of practical zoology invertebrates --S.S.Lal
- (13) A textbook of practical zoology vol 3 & 4 --S.S.Lal

Distribution of Work load and weightage of marks Paper-Z501

Unit Subject Total period Marks

Unit	Subject	Marks	Total period
Unit 1	Systematic	14	09
Unit 2	Forms and Functions in Animals	14	14
Unit 3	Invertebrate Part I (Protozoa to coelenterates)	14	22
Unit 4	Invertebrate Part II (Platyheleminthes to Arthropoda)	14	17
Unit 5	Invertebrate Part III (Mollusca to Hemichordata)	14	10

B.SC Semester V
Zoology Practical Exam Skeleton
Practical Paper No.1
Based on Paper—Z 501

Time : 3 Hrs

Total- 35 Marks

Que:1 Dissect the given animal and expose the _____ System.

Show it to examiner. (Practical no 5, 6, 8, 9 & 10) (05)

Que:2 Make a temporary mounting of _____ from the given animal. (03)

(Practical-7 and 11)

Que:3 Make a temporary preparation from the given material. Stain it if necessary,

Identify and show it to the examiner. (03)

(Practical-12)

Que:4 Sketch and label as per instruction. (04)

(Practical-14)

Que:5 Write as per given instruction. (10)

(1) Identify and classify giving reason (Lower invertebrate)

(2) Identify and classify giving reason (Higher invertebrate)

(3) Identify and Describe (Practical-13)

(4) Identify and Describe. (Practical-15(a))

(5) Identify and Describe. (Practical-15(b))

Que : 6 Submission (05)

Que:6 Certified Journal. (03)

Que:7 Viva Voce (02)

B.SC Semester V

Zoology Syllabus

Paper-Z-502

Fisheries biology, Animal Husbandry, Bioinstrumentation, Toxicology, Biostatistics

Unit-1 Fisheries Biology

1.1 Inland fisheries and fish pond

1.2 Induced breeding

1.3 Nutrition in fish

1.4 Fish feed

1.5 Fish Diseases

(Dropsy, Fungus infection, Gill rot, White spot, Costiasis, Argulus diseases)

1.6 Fish by product

1.7 Post harvesting technique

Unit-2 Animal Husbandary

2.1 Apiculture

Life cycle of honey bee

Behaviour

Procedure of apiculture and Application

2.2 Sericulture

Life history

Rearing of silk worm

Unit-3 Bioinstrumentation

3.1 Electrophoresis

3.2 Chromatography

3.3 Vectors (YAC, BAC, Plasmid, Bacteriophage)

3.4 Restriction Enzymes

3.5 General introduction of cloning

Unit-4 Toxicology

4.1 Introduction of toxicology

4.2 Classification of toxicants

4.3 Metal as toxicants (Arsenic, Fluoride and Lead)

Unit-5 Biostatistics

5.1 Introduction

5.2 Mean

5.3 Median

5.4 Mode

5.5 Standard Deviation

5.6 Standard Error

5.7 Application

B.SC. Semester-V
Zoology Practical Syllabus
Based on Paper-Z-502

Unit -1 Fisheries Biology

Classification of fishes

Part 1 (1) Tiger Shark (2) Hammer headed shark (3) Electric ray (4) Pristis (5) Trygon
(6) Chimera (7) Protopterus (8) Acipensor.

Part 2 (1) Lepidosteus (2) Diadon (3) Labeo (4) Ophiocephalus (5) Anguilla (6)
Anabas (7) Syngnanthus (8) Ostracion.

Part 3 Edible fishes and animal of Saurashtra Sea-coast.

(1) Prawn (2) Lobster (3) Loligo (4) Oyster (5) Pomfret (6) Bombay Duck (7)
Ghol fish (8) Dara fish (9) Koth (10) Shark (11) Catla (12) Mrigal.

Part-4 Fish by product

Part-5 Post harvesting technique (Sun drying, canning, freezing, salting)

Unit-2 Animal Husbandry

Part 1 Apiculture

(a) Life cycle of Honey Bee

Part 2 Sericulture

(b) Life cycle of silkworm

Unit-3 Bioinstrumentation

3.1 To make a culture of E.coli

3.2 Vectors by chart

3.3 Micro organism by slide preparation

Yeast and Bacteria (from stain method)

3.4 To study SDS electrophoresis

3.5 Detection of amino acid by paper chromatography

Unit-4 Toxicology

4.1 Effect of toxicants on human body

Unit-5 Biostatistics

5.1 Mean (any one example)

5.2 Median (any one example)

5.3 Mode (any one example)

5.4 Standard Deviation (any one example)

5.5 Standard Error (any one example)

PRACTICAL INDEX

Practical no 2 Based on PaperZ-502

1. Classification of fish (Part I)
2. Classification of fish (Part II)
3. Important edible fishes and some invertebrate of Saurashtra sea-coast
4. Study of fish by-product
5. To study post harvesting technique
6. To study life-cycle of Honey bee and silk worm
7. To study Preparation of culture of E.coli
8. To study Vectors by chart
9. To study how to make insulin using rDNA technology by chart
10. To study SDS electrophoresis
11. To study detection of amino acid by paper chromatography (model/chart)
12. To study microorganism by slide preparation(Yeast & Bacteria)
13. To study effect of Arsenic, fluoride and lead on human body (chart/Photographs)
14. To study example of Mean median and mode (one example for each)
15. To study example of Standard deviation and standard error (one example for each)
16. Visit to any one national park or sanctuary or fish processing plant or fishing area or reserve forest area or any educational institute which is relevant to the subject

A list of references books of Paper-502

- (1) Fish & Fisheries of India ---V.G.Jhingram
- (2) Fishes an introduction to Ichthyology ---Paper and Moyle
- (3) Hand book of tropical aquarium fishes ---HerberR.Axclrod
- (4) Marine fisheries ---D.V.Bal ,K.V.Rao
- (5) Ichthyology ---S.Chand
- (6) Text book of applied entomology --Srivastava
- (7) Economic zoology --Shukla &Upadhyaya
- (8) Pest management & Pesticides Indian scenario --Nyar B.V.
- (9) Wild life of Gujarat --H.S.Sing
- (10) Natural inheritance in Gujarat --H.S.Sing
- (11) Poultry science --MihirSuthar
- (12) Elements of Bio-technology --P.K.Gupta
- (13) Molecular Biology & Biotechnology --R.A.Meyers
- (14) Biotechnology --KeshavTrehan
- (15) Fundamentals of computers --V.Rajaraman
- (16) Fish & Fisheries --Pandey & Shukla

Distribution of Work load and weightage of marks Paper-Z502

Unit Subject Total period Marks

Unit	Subject	Marks	Total period
Unit 1	Fisheries Biology	14	18
Unit 2	Animal Husbandry	14	05
Unit 3	Bioinstrumentation	14	20
Unit 4	Toxicology	14	10
Unit 5	Biostatistics	14	17

B.Sc. Semester V
Zoology Practical Exam Skeleton
Practical Paper No.2
Based on Paper—Z502

Time: 3 Hrs

Total- 35 Marks

Que: 1 Write as per instruction. (20)

- (1) Identify and classify giving reason (Practical-1)**
- (2) Identify and classify giving reason (Practical-2)**
- (3) Identify and describe (Practical-4)**
- (4) Identify and describe (Practical-5)**
- (5) Identify and describe (Practical-7)**
- (6) Identify and give its economic importance (Practical-3)**
- (7) Identify and describe (Practical-8)**
- (8) Identify and Describe (Practical-9/10/11)**
- (9) Identify and comment on economical importance (Practical- 6)**
- (10) Identify and describe (Practical- 13)**

Que:2 Make a temporary slide of microorganism (Practical-12) (04)

Que:3 Calculate example (Practical 14/15) (03)

Que :4 Submission of tour report (03)

Que:5 Viva-voce (02)

Que:6 Certified Journal (03)

B.SC
Zoology Syllabus
Semester V
Paper-Z-503

Biochemistry Part-I, Biochemistry Part-II, Cytology, Genetics, Fundamental Processes

Unit-1 Biochemistry Part -I

1.1 Carbohydrates

Classification of carbohydrate

Metabolism of carbohydrate

(a) Glycolysis

(b) Glycogenesis

Importance of carbohydrate

1.2 Proteins

General Structure of amino acids

Classification of amino acids (essential and non-essential)

Classification of protein

Structural organization of Protein (Primary, Secondary, tertiary and quaternary)

Metabolism of Protein - Urea cycle

Importance of protein

1.3 Vitamins

Introduction, Source, function and deficiency

Unit-2 Biochemistry Part -II

2.1 Lipid

Classification of lipid

β- Oxidation

Importance of lipid

2.2 Enzymes

Introduction, Definition, Chemical Nature and properties

Classification and types of enzyme

Factor affecting enzyme activity

(Temperature, PH, enzyme concentration, substrate concentration, and radiation)

Mechanism of enzyme action (Lock and Key theory and Induce fit model)

2.3 Minerals

Introduction, Source, function

Unit-3 Cytology

3.1 Cytoskeleton

3.2 Cell cycle

3.3 Cancer

(a) Introduction (b) Types of cancer (c) Characteristics of cancerous cells

3.4 Possible causes of cancerous growth of Carcinogenesis by

- Mutation theory (2) Virus theory (3) metabolic theory (4) Hormonal disturbance theory (5) Irritation theory.

Unit-4 Genetics

4.1 Molecular genetics Concept of gene

Molecular structure of gene

Chromosomal mutation-only structure

(Deletion, duplication, inversion, translocation)

4.2 Mutagenic agent

4.3 Prenatal sex and diagnosis (amniocentesis)

4.4 Human hereditary traits (pedigree analysis)

(Colour blindness, Haemophilia, ear pinna and Baldness).

4.5 DNA fingerprinting

Unit-5 Fundamental Processes

5.1 Types of DNA and RNA

5.2 Types of Replication

5.3 DNA Replication

5.4 Transcription

5.5 Translation

B.SC. Semester-V
Zoology Practical Syllabus
Practical -3
Based on Paper-Z-503

Unit-1 &2 Biochemistry

- Detection of carbohydrates
- Glucose (2) Maltose (3) Starch
- Detection of proteins from milk
- Detection of proteins from egg
- Detection of lipids

Unit-3 Cytology

2.1 Temporary preparation of mitosis cell division

Onion root tip

2.2 Temporary preparation of meiotic cell division From plant material(Bud of tradeschantia)

Unit-4 Genetics

3.1 Temporary mounting of bar body

3.2 To study Chromosomes from drosophila/chironomous Larva by permanent slide

3.3 Pedigree analysis

(1) Transmission of autosomal recessive trait

Eg:-Thalasemia

- Transmission of sex linked recessive trait

Eg:- Red-green colour blindness and hemophilia

- Transmission of Y linked dominate trait.

A. Hairy pinna

B. Baldness

Unit -5 Fundamental Processes

Process of DNA replication by chart

Process of transcription by chart

Process of translation by chart

PRACTICAL INDEX

Practical no 3 Based on PaperZ-503

1. Detection of glucose
2. Detection of maltose
3. Detection of starch
4. Detection of protein from milk
5. Detection of protein from egg
6. Detection of lipid
7. Temporary preparation of mitosis cell-division from onion root-tip
8. Temporary preparation of meiosis cell-division from bud of Tradescantia
9. Temporary preparation of Barr body
10. To study a transmission of autosomal recessive trait
11. To study transmission of sex-linked chromosome trait
12. To study transmission of Y-linked dominant trait
13. To study process of DNA replication by chart
14. To study process of transcription by chart
15. To study process of translation by chart

A list of references books of Paper-503

- (1) Biochemistry ---- Das Gupta S.K
- (2) Biochemistry --- Stryer.L.
- (3) Out line Biochemistry --- Conn.et.al
- (4) Molecular biology of the cell ---
Alberts et.al (5) Molecular boiology --
--Arumajan
- (6) Cell in development
& Inheritance --- Wilson E.B.
- (7) Principle of Biochemisry --- Lehninger
- (8) Cell molecular biology --- De Roberties & De Roberties
- (9) Gene VII ---- Lewin
- (10) Cytology ---- Veerbala Rastogi
- (11) Cytology --- Agarwal
- (12) Genetics --- Meyyer & Anderson
- (13) Genetics --- Edger Altenburg
- (14) Cytology, Genetics & Evolution --- P.K.Gupta
- (15) Genetics --- Strick berger

Distribution of Work load and weightage of marks Paper-Z503

Unit Subject Total period Marks

Unit	Subject	Marks	Total period
Unit 1	Biochemistry-I	14	18
Unit 2	Biochemistry-II	14	12
Unit 3	Cytology	14	10
Unit 4	Genetics	14	18
Unit 5	Fundamental processes	14	12

B.SC Semester V
Zoology Practical Exam Skeleton
Practical Paper No.3
Based on Paper—Z503

Time : 3 Hrs

Total- 35 Marks

Que:1 Detect the components with biochemical test from the given sample.

Write each step in answer book, show it to the examiner. (Practical 1 to 6)

(08)

**Que:2 Perform the practical as per instruction and write in answer book,
show it to examiner. (Practical 10 to 12)**

(08)

**Que:3 Make a temporary stain preparation of _____ as per
examiner instruction. (Practical 7 to 9)**

(08)

Que:4 Write as per given instruction

(06)

(1) Identify and describe (Practical 07 and 08)

(2) Identify and describe (Practical 13 to 15)

(3) Identify and comment upon biochemical test. Write a final conclusion

(4) Identify and describe (Practical 10 to 12)

Que:5 Viva-voce

(02)

Que:6 Certified Journal

(03)

B.SC
Zoology Syllabus
Semester VI
Paper-Z-601

Functional Anatomy of Chordates & Comparative Study

Unit-1 Systematic

- Salient features and classification up to orders in proto chordate and lower chordate.
- Salient features and classification up to orders in higher chordate.

Unit-2 Form and function in animals

2.1 General structure and morphology with functional anatomy of following type animals

[A] Class- Aves- Pigeon

External features
Digestive system,
Heart
Arterial system
Venous system
Reproductive system
Brain (By chart)

[B] Class-Mammals- Rat

External features
Digestive system,
Heart
Arterial system
Venous system
Reproductive system
Brain (By chart)

Unit-3 Chordate Part I (Urochordata to Amphibia)

3.1 Urochordata:- Affinities

3.2 Pisces :- General organization and affinities of dipnoi, air bladder of fishes,
Migration in fishes and Parental care in fish

3.3 Amphibia :- Neotony, Parental care, Aestivation and Hibernation

Unit-4 Chordate Part II (Reptiles to Mammals)

4.1 Reptiles :- Temporal fossae

Living fossils-Sphenodon

4.2 Aves :- Archaeopteryx as connective link between reptiles and aves

Migration in birds

Types of Feathers (Seed eating, Fruit eating, insectivores, tearing and piercing, water and mud straining beak)

Types of beaks and claws (Running feet, Perching feet, scratching feet, Raptorial feet, swimming feet)

4.3 Mammals :- Egg laying mammals (Monotremes)

Pouched mammals (Marsupials)

Placental mammals- Chiroptera,

Primates (Lemur, Loris, chimpanzee, gorilla, macaca)

Carnivore (Asiatic lion, tiger, cheetah, Sloth bear)

Cetacean (Sperm whale, killer whale, dolphin, blue whale.)

Unit-5 Comparative anatomy of chordates

5.1 Comparative study of heart (Shark, frog, calotes, Pigeon and Rat)

5.2 Comparative study of aortic arch (Shark, frog, calotes, Pigeon and Rat)

5.3 Comparative study of brain (Shark, frog, calotes, Pigeon and Rat)

5.4 Dentition: - Types of teeth and dental formula in mammals.

B.SC.
Zoology Practical Syllabus
Semester-VI
Practical -1
Based on Paper-Z-601

Unit-1 Identificaiton classification upto order

- 1.1 Urochordata :- Ciona, Salpa, Pyrosoma
- 1.2 Cephalochordata :- Amphioxus
- 1.3 Cyclostomata :- Lamprey
- 1.4 Fish :- Hammer headed, Barbus
- 1.5 Amphibia :- Bombinator, Uraeotyphlus, Alytes, Triturus
- 1.6 Reptiles :- Hemidactylus, Natrix, Python, Krait, Russells viper, pitviper
- 1.7 Aves :- Archaeopteryx, Eagle, Bubobus
- 1.8 Mammals :- Talpa, Porcupine

Unit-2 Form and function in animals

2.1 Pigeon :-

External features
Digestive system,
Arterial system
Venous system
Reproductive system
Brain (By chart)

2.2 Rat :-

External features
Digestive system,
Arterial system
Venous system
Reproductive system
Brain (By chart)

2.3 Mounting:- Pigeon : (Pecten and Air sac)

Rat: (Striated muscle and blood)

Unit-3 Preparation from preservative materials

3.1 Amphioxus

3.2 Filoplume feather

3.3 Down feather

Unit-4 General Practicals Parental care in fishes:- Amia, Hippocampus

4.1 Migration in fishes:- Salmon, Hilsa

4.2 Sphenodon by chart or model

4.3 Archeopteryx by chart or model

4.4 Types of Feathers (Seed eating, Fruit eating, insectivores, tearing and piercing, water and mud straining beak)

4.5 Types of beaks and claws (Running feet, Perching feet, scratching feet, Raptorial feet, swimming feet)

Unit-5 Comparative Anatomy

5.1 Heart

5.2 Aortic arch

5.3 Brain

5.4 Dentition in mammals:- Dog, Pig, Goat, Horse, Dog and Cow.

PRACTICAL INDEX

Practical no 1 Based on PaperZ-601

1. Classification of protochordata to Amphibia
2. Classification of reptiles to mammals
3. To study digestive system, arterial , venous, brain, reproductive system of Pigeon
4. To study digestive system, arterial , venous, brain, reproductive system of rat
5. To study mountings of rat (Striated muscle and blood and pecten)
6. Preparation from preservative materials
7. To study parental care in fishes
8. To study migration in fishes
9. To study sphenodon through chart or model
10. To study Archaeopteryx by chart or model
11. To study types of beaks and claws in birds
12. To study a comparative account of Heart
13. To study a comparative account of Aortic arch
14. To study a comparative account of Brain
15. To study dentition in mammals

A list of References Book of Paper –Z601

- Vertebrate Zoology --R.L.Kotpal
- Vertebrate Zoology --E.L. Jorden
- Vertebrate Zoology --Dr. S.N. Prasad
- A student text book of zoology vol.1&2 --Adan Sedwick
- Chordate structure and function --Waerman A.J.
- Analysis of vertebrate structure --Hilcle Brand
- An outline of comparative anatomy --Kingsley
- The vertebrate body --Romer&Persons
- Zoology of chordates --Nigam H.S.
- The chordates --Alexander R.M.
- An introduction of comparative zoology --Whifield&Wood
- A text book of practical zoology-Vertebrate --S.S. Lal
- A text book of practical zoology Vol III &IV --S.S.Lal

Distribution of Work load and weightage of marks Paper-Z601

Unit Subject Total period Marks

Unit	Subject	Marks	Total period
Unit 1	Systemics	14	08
Unit 2	Form and function in animals	14	25
Unit 3	Chordate Part I	14	12
Unit 4	Chordate Part II	14	07
Unit 5	Comparative anatomy of chordates	14	18

B.SC
Zoology Practical Exam Skeleton
Practical Paper No.1 Semester VI
Based on Paper—Z601

Time : 3 Hrs

Total- 35 Marks

Que:1 Dissect/Sketch and labeled_____ in _____ and show it to the examiner (Practical- 3 and 4) (06)

Que:2 Mounting/ Sketch and labeled_____ in _____ and show it to the examiner (Practical-5) (03)

Que:3 Identify and explain in detail. Write and sketch a comparative account in answer book (Practical- 12 to 13) (04)

Que:4 Make a temporary preparation from given material. Stain it if necessary, Identify and show it to examiner (Practical- 6) (03)

Que:5 Write as per given instructions: (10)

(1) Identify and classify giving reasons (Practical-1)

(2) Identify and classify giving reasons (Practical-2)

(3) Identify and describe (Practical- 7 & 8)

(4) Identify and describe (Practical-9 & 10)

(5) Identify and describe (Practical-11)

Que:6 Any five photographic presentation of animals(vertebrates) (Description with academic value) (05)

Que:7 Viva-voce (02)

Que:8 Certified Journal (02)

B.SC Semester VI

Zoology Syllabus

Paper-Z-602

Cardiovascular system, Respiration and Muscular System, Endocrinology and Reproduction, Immunology and Sense organ and Histology

Unit-1 Cardiovascular System

1.1 Heart:- Structure, origin, conduction and regulation of heart beat, cardiac cycle and E.C.G.

1.2 Blood pressure

1.3 Physiology of blood clotting

Best and Tylor' theory

Howell's theory

Unit-2 Respiration and Muscular system

2.1 Exchange of gases

2.2 Transport of gases

2.3 Respiratory pigment

2.4 Structure and function of skeletal muscle

Unit-3 Endocrinology and Reproduction

3.1 Introduction of endocrine gland

3.2 Types of hormone

3.3 Endocrine gland and its hormone

3.4 Menstrual cycle

3.5 Oestrus cycle

Unit-4 Immunology and Sense Organ

4.1 Introduction of immune system

4.2 Innate immunity

- 4.3 Adaptive immunity
- 4.4 Ig structure and its type
- 4.5 Gustato receptor
- 4.6 Photo receptor
- 4.7 Phono receptor

Unit-5 Histology

- 5.1 Principles involved in general techniques for tissue fixation
 - (a) Preparation
 - (b) Sectioning
 - (c) Staining
- 2.2 General account of different types of fixatives
- 2.3 A knowledge of stains and preparation of different stains:-
 - (a) Eosin
 - (b) Haematoxyline
 - (c) Toluidine blue (d) Methyl blue
 - (e) Acetocarmine
- 2.4 Histological structure
 - (a) Adrenal gland
 - (b) Ovary
 - (c) Testis

B.SC. Semester-VI
Zoology Practical Syllabus
Practical -2
Based on Paper-Z-602

Unit 1 Physiology

- 1 Red blood corpuscles (Erythrocytes) count
- 2 White blood cell (Leucocytes) count
3. Haemoglobin estimation
- 4 To check the blood pressure
- 5 Counting of pulse rate at rest and after exercise
6. Preparation of Haemin crystals

Unit:2 Histology

- 1 a study of various kinds of fixatives(one each made in alcohol, acetic acid and aqueous Bouin's fluid, Carnoy's fluid)
- 2 A study of various kinds of stains(Eosin, Haemotoxylin, Methyl blue, Acetocarmine)
- 3 A process of making permanent histological slide by single staining technique
- 4 A process of making permanent histological slide by double staining technique
- 5 a study of histological structure through permanent slides (Adrenal gland, testis, ovary)
- 6 To study of micro technique and preparation of permanent histological slides
 - 5.1 Collection of tissue and fixation
 - 5.2 Washing in running tap water
 - 5.3 Dehydration
 - 5.4 Dealcoholization (clearing)
 - 5.5 Embedding

5.6 Block preparation

5.7 Sectioning

5.8 Staining and mounting 6.9 Identification and naming of slides

PRACTICAL INDEX

Practical no 2 Based on Paper Z-602

1. Red blood corpuscles count
2. White blood cell count
3. Haemoglobin estimation
4. To check the blood pressure
5. Counting of pulse rate at rest and after exercise
6. Preparation of haemin crystals
7. A study of various kinds of fixatives
8. A study of various kinds of stain
9. A study of histological structure through permanent slides
10. Obtaining the tissue and fixation
11. To wash in running tap-water
12. Dehydration and De-Alcoholization (clearing)
13. Embedding and Block preparation
14. Sectioning, Staining and mounting
15. Identification and naming of slide

A list of References Book of Paper –Z602

- Animal physiology --Eckert
- Essential of animal physiology --S.C.Rastogi
- Element of animal physiology --R.Nagabhushanam
- General and comparative physiology --Hoar
- Human physiology --Cheterji
- Principal of animal physiology --Wood D.W.
- Physiology of animal --Tortora&tortora
- Comparative animal physiology --Prosser C.L.
- Text book of Baley's Histology --Copenharverbunga&burge
- Endocrinology --Hadley
- Hand book of experimental physiology&biochemistry
--Dr.P Vijay Chandha
- Animal Physiology --Richard W. Hill
- A text-book of the principles of animal histology. -- Ulrie Dahlgren
- Practical Haematology -- Dacie and Lewis
- Animal physiology --Shastri&Gohil

Distribution of Work load and weightage of marks Paper-Z602

Unit Subject Total period Marks

Unit	Subject	Marks	Total period
Unit 1	Cardiovascular system	14	12
Unit 2	Respiration and Muscular system	14	15
Unit 3	Endocrinology and Reproduction	14	23
Unit 4	Immunology and Sense organ	14	13
Unit 5	Histology	14	07

B.SC
Zoology Practical Exam Skeleton
Practical Paper No.2 Semester VI
Based on Paper—Z602

Time : 3 Hrs

Total- 35 Marks

- Que:1 Make a permanent slide from the given histological material with staining technique and show it to examiner (06)**
- Que:2 Set up _____ experiment and write in answer book (08)**
- Que:3 Check the blood pressure/Counting of pulse rate (04)**
- Que:4 Write as per given instruction (08)**
- (1) Identify and comment on histological structure**
- (2) Identify and comment on functional activities or write a detail formula with proper effect**
- (3) Identify and describe**
- (4) Identify and describe**
- Ques:5 Submission of permanent slide / W.M (05)**
- Que:6 Viva-voce (02)**
- Que:7 Certified Journal (02)**

B.SC
Zoology Syllabus
Semester VI
Paper-Z-603

Reproductive physiology and Embryology, Developmental biology, Wild life, Ecology & Environmental pollution, Evolution

Unit 1 Reproductive physiology and Embryology

- 1.1 Structure and function of mammalian ovum
- 1.2 Structure and function of mammalian sperm
- 1.3 Structure of mammary gland
- 1.4 Fertilization, Cleavage, blastula, gastrula and embryonic development of chick upto 72.

Unit 2 Developmental biology

- 2.1 Parthenogenesis in general
- 2.2 Placenta and placentation
 - Types on basic attachment and histological structure
- 2.3 Regeneration
 - Planaria and salamander

Unit -3 Wild life

- 3.1 Hotspots of biodiversity
- 3.2 Endangered and endemic species of India
- 3.3 Keystone species
- 3.4 In situ and Ex situ conservation
- 3.5 Wild life agencies- WWF, Indian Board of wild life, CITES.
- 3.6 Sanctuaries and national parks of India.

(National park: Jim Corbett, Ranthambhor, Periyar, Kaziranga, Kanha)

(Sanctuaries: Dachigam, Keoladeo, Madhumalai, Chilika lake, Manas)

Unit 4 Ecology & Environmental pollution

- 4.1 Air pollution
- 4.2 Water pollution

4.3 Soil pollution

4.4 Green house effect

4.5 Bio-geochemical cycle- O₂, N₂, CO₂, H₂S, Ph

4.6 Population ecology

Population density, Natality, Mortality, Age distribution, Population growth, Population equilibrium.

Unit 5 Evolution

Zoo geographical distribution

Macro and micro evolution

Geological Period

Evolution of man

B.SC. Semester-VI
Zoology Practical Syllabus

Practical -3

Based on Paper-Z-603

Unit 1 &2 Reproductive physiology & developmental biology

- 1.1 To study permanent slide of mammalian ovum(T.S.) and oogenesis process by chart/multimedia teaching method
- 1.2 To study permanent slide of mammalian sperm(T.S.) and spermatogenesis process by chart/multimedia teaching method
- 1.3 To study T.S. mammary gland by chart/multimedia teaching method
- 1.4 A study of permanent slide of chick embryo
(18, 24, 33, 48, & 72 hrs)
- 1.5 T.S. of chick embryo showing the development of neurulation (24, 33 hrs)
- 1.6 T.S. of chick embryo showing the development of heart (24, 33 hrs)
- 1.7 Mounting of chick embryo Any 2 stage of embryonic development

Unit-3 Wildlife

- 3.1 Study of wild animals foot print (Lion, Leopard, Tiger, Sambhar, spotted deer, Hyena)
- 3.2 National parks and sanctuaries of India.
(National park : Jim Corbett, Ranthambhor, Periyar, Kaziranga, Kanha)
(Sanctuaries :Dachigam, Keoladeo, Madhumalai, Chilika lake, Manas)
- 3.3Endemic Species of india
 - (a) Amphibia and Reptiles : Indian bull frog, tree frog, Gharial, Star tortoise
 - (b) Birds : ParadiscFlycather, Bee eater, Flamingo, Great Indian bustard
 - (c) Mammals : Chital, Barasingha, Hangul deer, Lion tailed macaque

Unit -4 Ecology & Environmental pollution

- 4.1 An estimation of total hardness
- 4.2 Estimation of O₂ from tap water
- 4.3 Estimation of O₂ from polluted water
- 4.4 Estimation of chlorinity and salinity from tap water
- 4.5 Estimation of chlorinity and salinity from polluted water
- 4.6 To study physical characterisites of soil texture, colour and temperature
- 4.7 To study Water holding capacity of soil

Unit 5 Evolution

5.1 A study of zoogeography distribution

5.2 Evolution of man

Java man, Neanderthal man, Rhodesian man, Cro magnon man, modern man

PRACTICAL INDEX

Practical no 3 Based on PaperZ-603

1. To study permanent slide of mammalian ovum, sperm, mammary gland (T.S.) and oogenesis and spermatogenesis process
2. To study of T.S. of neurulation in chick embryo by permanent slide
3. To study of development of T.S. of heart in chick embryo by permanent slide
4. To study a chick embryo development by mounting (any one stage) and permanent slide
5. To study National parks and Wild life sanctuaries of India
6. To study endemic amphibian to mammals species of India
7. To study estimation of total hardness
8. To study estimation of O₂ from tap water
9. To study estimation of O₂ from polluted water
10. To study estimation of chlorinity and salinity in tap water
11. To study estimation of chlorinity and salinity in polluted water
12. To study physical characteristics of soil texture, colour and temperature
13. To study water holding capacity of the soil
14. To study zoo-geographic distribution.
15. To study evolution of man.

A list of references books of Paper-603

- (1) Reproductive Physiology --- Nalbandov A.V
- (2) Reproductive cycles --- Saidapur S.K.
- (3) General Endocrinology --- Bagnara & Turne
- (4) Introduction of Embryology --- Balansky
- (5) A text book of Embryology --- Pattern
- (6) Chordate Embryology --- Verma & Others
- (7) An outline of
Animal development --- Deven Port
- (8) Development of Biology --- Shubremaniyam
- (9) Development of Biology --- Gilbert
- (10) Introduction of Evolution --- Moody
- (12) Evolution --- Savoge
- (13) Evolution --- Franklin Shull
- (14) Zoo Geography --- Darlington
- (15) Organic Evolution --- Arumugun
- (16) Environment Science --- Turk & Turk
- (17) Principle of Environment Biology --- P.K.G.Nair
- (18) Fundamental of Ecology --- Odum
- (19) Ecology --- Ricklets
- (20) Elements of Ecology --- Sharma & Mishra
- (21) Practical zoology ---
- (22) Environmental studies --- S.V.S.Rana

Distribution of Work load and weightage of marks Paper-Z603

Unit Subject Total period Marks

Unit	Subject	Marks	Total period
Unit 1	Reproductive Physiology and Embryology	14	15
Unit 2	Developmental biology	14	15

Unit 3	Wildlife biology	14	15
Unit 4	Ecology & Environmental pollution	14	10
Unit 5	Evolution	14	15

B.SC
Zoology Practical Exam Skeleton
Practical Paper No.3 Semester VI
Based on Paper—Z603

Time : 3 Hrs

Total- 35 Marks

Que:1 Make a temporary embryo mounting from the given egg. Stain and identify the age of the embryo and show it to the examiner (07)

Que:2 Estimation of _____ from given sample. Write each step in answer book and show it to examiner (07)

Que:3 Check the _____ from the given sample. Write each step in answer book and show it to examiner (04)

Que:4 Write as per given instructions (08)

(1) Identify and describe

(2) Identify and describe

(3) Identify and describe

(4) Identify and describe

Que:5 Tour report (05)

Que: 6 Viva voce (02)

Que:7 Certified Journal (02)