# SAURASHTRA UNIVERSITY

# RAJKOT

Accrediated Grade 'A' by NAAC

(CGPA 3.05)

FACULTY 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**

## 2016 - 17

Saurashtra University
University Campus, Rajkot – 360 005.
Gujarat, India.

**Website: www.saurashtrauniversity.edu**

# 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 & Histology, Ecology, Fisheries Biology& Wild life Biology | ( In Sem -II) Chordate: Systematic, Forms & Functions, Genetics, Evolution, Physiology, Embryology, Applied Zoology, Reproductive Biology and Functional Anatomy of chordates |
| 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 |
| 19 | Core | 0 | 0 | 0 | 0 |

# SAURASHTRA UNIVERSITY

# RAJKOT

# 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**

**Revised Syllabus**

**INFORCE FROM JUNE – 2016**

# SAURASHTRA UNIVERSITY

# RAJKOT

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

INFORCE FROM JUNE – 2016

# 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: Systematics, Forms & Functions, Cell biology & Histology, Ecology, Fisheries Biology & Wild life Biology

SEMESTER – II

ZOOLOGY PAPER – Z – 02

Chordate: Systematic, Forms & Functions, Genetics, Evolution, Physiology, Embryology, Applied Zoology, Reproductive Biology and Functional Anatomy of chordates

# FORWARD

Renewing and updating of the Curriculum is the prime important criteria in the University education system.

Syllabus provides an educational guide line and demarks the horizon of a subject. Syllabus of different Theory and Practical papers should have subjective harmony and gradual relationship within periphery of a subject.

Formulation of Curriculum for a particular subject requires the following criteria.

(A) Background of previous Curriculum.
(B) Relationship with other related subjects.
(C) Resources of Educational needs at regional level as well as national level.
(D) Financial and Statuary provisions of the State government.

All the above criteria are taken into consideration in formulation of this Curriculum.

This Curriculum is the result of prolonged discussions among the experienced teacher in this subject because after all, the college teachers are the real catalysts for implementation of this Syllabus.

The proposed Syllabus after required formalities will be implemented in the first year B.Sc.

Valuable guidelines and all facilities in this curriculum are provided by the authorities of the Saurashtra University, Rajkot.

**DR. CHIRAG M. GOSAI**
Chairman,
Board of Studies, Zoology,
Saurashtra University,
Rajkot – 360 005.

**Dr. B. B. RADADIYA**
Other than Chairman,
Board of Studies, Zoology,
Saurashtra University,
Rajkot – 360 005

# SAURASHTRA UNIVERSITY

RAJKOT

(CBCS Syllabus)

## SEMESTER – I

# ZOOLOGY

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

## PAPER – Z-01

Non Chordates: Systematics, Forms & Functions, Cell biology & Histology, Ecology, Fisheries Biology& Wild life Biology

## UNIT – 1: SYSTEMATICS

Salient feature & classification up to classes in Non-chordates, structural organization in different phylum of Non-chordates with examples.
Kingdom- Protista, Phylum-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.**
**2.3 ARTHROPODA – Type Study: Mosquito.**

(i) Life cycle of Culex & Anopheles Mosquito.
(ii) Mouth parts of Culex & Anopheles mosquito.

## UNIT – 3: CELL BIOLOGY AND HISTOLOGY

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

(i) Mitochondria
(ii) Nucleus
(iii) Endoplasmic Reticuium
(iv) Plasma membrane

**3.2 HISTOLOGY: Histological structure and function of following organs of Mammals.**

(i) Stomach
(ii) Intestine
(iii) Liver
(iv) Pancreas

## UNIT – 4: ECOLOGY & FISHERIES BIOLOGY

**4.1 Introduction of Ecology**
**4.2 Marine Ecosystem.**
**4.3 Fresh water – Pond Ecosystem.**
**4.4 Ecological Adaptations:**
- (i) Fossorial Adaptation
- (ii) Aquatic Adaptation
- (iii) Arborial Adaptation
- (iv) Volant Adaptation
- (v) Desert Adaptation

**4.5 Introduction of fish morphology**
**4.6 Difference between Chondrichthyes and Osteichthyes**
**4.7 Scales in fishes**
**4.8 Types of fishing Boats & Nets**

## UNIT – 5: WILDLIFE BIOLOGY

**5.1 Introduction & Importance of Wildlife.**
**5.2 Difference between National Parks & Sanctuaries**
**5.3 Wildlife in Gujarat:**

(I) NATIONAL PARKS: (i) Gir National Park.
(ii) Marine National Park in Gulf of Kutch.

(II): SANCTUARIES: (i) Kutch desert wildlife sanctuary.
(ii) Barda wildlife sanctuary.
(iii) Nalsarovar bird sanctuary.
(iv) Khijadia bird sanctuary.

# 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, Rhizoastoma, Metridium

**Practical: 2 :** Identification and Classification of Invertebrate animals.

(i) Phylum: Platyhelminthes : - Planaria, Liverfluke, 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, Lobester, 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, 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: 9 :** Study of permanent slides (Mosquito):

(i) Life cycle of Culex Mosquito.
(ii) Life cycle of Anopheles mosquito.
(iii) Mouth Parts of Culex and Anopheles Mosquito.

**Practical: 10 :** Study of following cell organelles.

(i) Mitochondria
(ii) Nucleus
(iii) Endoplasmic Reticulum
(iv) Cell Membrane

- By photograph, Chart, Model, or multimedia.

**Practical: 11 :** Study of Histological structures of following Mammalian Organs.

(i) Stomach
(ii) Intestine
(iii) Liver
(iv) Pancreas

**Practical: 12 :** Study of different animals for Ecological Adaptation.

(i) Fossorial : Earthworm, Gryllotalpa, Snake, Rat.
(ii) Aquatic : Labeo, Crocodile, Turtle, Loligo.
(iii) Arboreal : Wall lizard, Chamelion, Squirrel, Monkey.
(iv) Volant : Exocoetus, Draco, Flying frog.

(v) Desert : Uromastix, Phrynosoma.

**Practical: 13 :** Fisheries Biology:

(i) Difference between Chondrichthyes and Osteichthyes
(ii) Scales in fishes
(iii) Types of fishing Boats & Nets

**Practical: 14 :** Study of Wild animals.

(i) Study of National parks and Sanctuaries of Gujarat state.
(ii) Study of following wild animals on the basis of zoo-geographical region as per theory
   (a). Asiatic Lion
   (b). Leopard
   (c). Corals
   (d). Jelly fish
   (e). Chinkara
   (f). Spotted deer
   (g). Greater flamingo
   (h). Painted stork
   - by photograph, Chart, stuffed animals or multimedia.

**Practical: 15 :** Instrumental Biology

Principle, structure & function of following instruments.
(i) Light microscope
(ii) Thermometer
(iii) pH Meter
(iv) Centrifuge

**Practical: 16 :** Visit to any one National Park or Sanctuary OR Fish processing plant OR Fishing area OR Reserve forest area.

# DISTRIBUTION OF UNITS

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

SEMESTER – I

| **PAPER – Z-01** | | | |
|---|---|---|---|
| **Unit No.** | **Unit Title** | **Theory Period** | **Marks.** |
| **Unit : 1** | Systematic | 10 | 14 |
| **Unit : 2** | Forms and Functions | 18 | 14 |
| **Unit : 3** | Cell Biology and Histology | 14 | 14 |
| **Unit : 4** | Ecology & Fisheries Biology | 13 | 14 |
| **Unit : 5** | Wildlife Biology | 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 carries equal 14 marks.
- Total marks for theory examination are 70 marks.
- **PAPER SETTER MUST FOLLOW THE UNIT WISE MARK SETUP.**

# SAURASHTRA UNIVERSITY - RAJKOT
# 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).**

**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 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]**

# SAURASHTRA UNIVERSITY - RAJKOT
# PRACTICAL EXAMINATION

**SEMESTER – I**

**ZOOLOGY**

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

(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&8) [03]

Que – 3: Do as per instruction and show it to examiner [03]

(Practical – 13)

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-11)
(E) Identify and describe (Practical-12)
(F) Identify and describe (Practical-14)
(G) Identify and describe (Practical-15)

Que. – 5: Report and Viva-voice. [03]

Que – 6: Certified Journal. [03]

# SAURASHTRA UNIVERSITY – RAJKOT

## 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]

(5) Permanent slides of Mosquitoes. [Practical-9]

(6) Histological structure of Mammalian organs. [Practical-11]

(7) Scales in Fishes. [Practical-13, (ii)]

## LIST OF SPECIMENS:

(1) All animal specimens from Phylum- Porifera to Phylum-Hemichordata. [Practical-1,(ii),(iii) to Practical-4]

(2) All animal specimens for Ecological Adaptations. [Practical-12]

(3) One animal of Chondrichthyes-Scoliodon & One specimen of Osteichthyes-Labeo/Catla/Pomfret. [Pratical-13, (i)]

## LIST OF CHARTS/MODELS/PHOTOGRAPHS:

(1) National Parks & Sanctuaries of Gujarat State & Wild animals on the basis of Zoo-geographical region. [Practical-14,(i),(ii)]

## LIST OF INSTRUMENTS:

(1) Light Microscope

(2) Thermometer

(3) pH Meter

(4) Centrifuse

# REFERENCE BOOKS

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

## SEMESTER – I

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 – Platyhelminthus……..…….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


19 : Ecology & Environmental biology…….…….P.D.Sharma.

20 : Cell Biology, Genetics, Molecular Biology, Evolution and Ecology…….…P.S.Varma & V.K.Agrawal.

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

22 : Basic Concepts of Ecology…….……A. Arumugam

23 : Elements of Ecology……....Robert & Thomas.

24 : Environmental Biology……...P.S.Verma & V.K.Aggrwal

25 : Fish and Fisheries of India……...……V.B.Jhingran.

List of books for Unit-5

26 : Wild Life of Gujarat…….……H.S.Singh.

27 : Indian National Parks and Sanctuaries……..…Khati &Annand S.

28 : Modern textbook of Zoology Vertebrates…….R.L.Kotpal

29 : Vertebrate Zoology…….….E.L.Jordan & Dr.P.S.Verma

30 : Practical Zoology Vertebrate…….S.S.Lal

List of Books for Viva-Voices

31 : Practical Zoology Invertebrate……..S.S.Lal

32 : Practical Zoology Vertebrate…….S.S.Lal

# SAURASHTRA UNIVERSITY
# RAJKOT
(CBCS Syllabus)
## SEMESTER - II
# ZOOLOGY
## 16-03-04-01-01-02-00

# PAPER – Z-02

Chordate: Systematic, Forms & Functions, Genetics, Evolution, Physiology, Embryology, Applied Zoology, Reproductive Biology and Functional Anatomy of chordates

## UNIT- 1: SYSTEMATIC, FORMS AND FUNCTIONS IN ANIMALS:

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

**1.2** 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- 2: GENETICS & EVOLUTION:

**2.1 MULTIPLE ALLELES:**
(i) Characters of multiple alleles.
(ii) The 'C' gene in Rabbit (Coat colour).
(iii) A, B, AB and O blood groups in Humans.
(iv) 'Rh' factor and Erythroblastosis foetalis.

**2.2 EVOLUTION:**
**(i) Introduction to Evolutionary Theories:** Lamarckism, Darwinism, Neo-darwinism
**(ii) Direct Evidences of Evolution:** Types of fossils, Incompleteness of fossil record, Phylogeny of Horse.

## UNIT- 3: PHYSIOLOGY & EMBRYOLOGY:

**3.1 DIGESTION:**
(i) Physiology of digestion in the alimentary Canal.
(ii) Absorption of carbohydrates, proteins, lipids.

**3.2 BLOOD:**
(i) composition of blood.
(ii) physiology of coagulation of blood

**3.3 SPERMATOGENESIS**
**3.4 OOGENESIS**

## UNIT- 4: APPLIED ZOOLOGY:

**4.1 A study of general structure and characters of following pathogenic animals:**
(i) Entamoeba.
(ii) Trypanosoma.
(iii) Filarial worm.
(iv) Guinea worm.
(v) Round worm.
(vi) Pin worm.

**4.2 A study of general characters and structure of following harmful parasitic Insects of mankind:**
(i) Human louse.
(ii) Bed bug.
(iii) Flea.

**4.3 Poultry science:**
(i) A general account of poultry science.
(ii) A type of poultry house.
(iii) Different apparatus used in poultry house.
(iv) A visit of poultry farm.
**4.4 A study of fresh water aquarium.**

## UNIT-5: REPRODUCTIVE BIOLOGY & FUNCTIONAL ANATOMY OF CHORDATES

**5.1 Menstrual cycle**
**5.2 Estrus cycle**
**5.3 Integumentary System:** Derivatives of integument: Glands and digital tips, Nails, Claws, Horns, Hoofs
**5.4 Circulatory system:** Origin & Evolution of heart.

# PRACTICAL RELATED ON PAPER – Z-02

**Practical: 1 :** Identification and classification of Chordate animals.

(i) Sub-Phylum : Urochordata : Herdmania
(ii) Sub-Phylum: Cephelochordata : 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, Salamander.
(ii) Class : Reptiles : Turtle, Draco, Chamaeleon, Mabuia (Skink), Varanus, Snake, Crocodile.
(iii) Class: Aves : Weaver Bird, Parrot, Owl, Wood pecker.
(iv) Class : Mammal : Duck-bill, Kangaroo, Hedge hog, Bat, Dolphin

**Practical: 3 :** 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: 4 :** Embryology of Amphioxus :

(i) Sperm
(ii) Ova
(iii) Fertilization
(iv) Cleavage
(v) Blastulation
(vi) Gastrulastion

-By slides or charts or Multimedia.

**Practical: 5 :** Examples of Genetics.

Examples should be taken from theory portion of Multiple Alleles only.

**Practical: 6 :** To determine own blood group & Rh factor.

**Practical: 7 :** To study of following Evolutionary charts / models/ pictures:

(i) Study of fossil evidence from plaster cast models and pictures
(ii) Study of homology and analogy from suitable specimens/ pictures
(iii) Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors
(iv) Darwin's finches with diagrams/ cut outs of beaks of different species.

**Practical: 8 :** Test of salivary Amylase for digestion of Starch.

**Practical: 9 :** General Emryology:
Study of oogenesis and spermatogenesis by chart or model.

**Practical: 10 :** Study of following pathogenic animals.

(i) Entamoeba

(ii) Trypanosoma

(iii) Filaria worm

(iv) Guinea worm

(v) Ascaris lumbricoides (Round worm)

(vi) Enterobius vermicularis (Pin-worm)

**Practical: 11 :** Study of following harmful parasitic insects.

(i) Human louse.

(ii) Bed bug.

(iii) Flea.

**Practical: 12 :** 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: 13 :** To study of Integumentary derivatives: Glands, Claws, Hoofs, Nails, Horns.

**Practical: 14 :** Origin & Evolution of heart and comparative account of it.

**Practical: 15 :** Visit to poultry farm/ Pathology Laboratory/ Natural History Museum And Submission Of Report.

# DISTRIBUTION OF UNITS

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

## SEMESTER – II

| PAPER – Z-02 | | | |
|---|---|---|---|
| **Unit No.** | **Unit Title** | **Theory Period** | **Marks.** |
| **Unit : 1** | Systematics, Forms and Functions | 15 | 14 |
| **Unit : 2** | Genetics & Evolution | 14 | 14 |
| **Unit : 3** | Physiology & Embryology | 13 | 14 |
| **Unit : 4** | Applied Zoology | 09 | 14 |
| **Unit : 5** | Reproductive Biology & Functional Anatomy of chordates | 14 | 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 carries equal 14 marks.
- Total marks for theory examination are 70 marks.
- **PAPER SETTER MUST FOLLOW THE UNIT WISE MARK SETUP.**

# SAURASHTRA UNIVERSITY - RAJKOT
# 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).**

**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 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]**

# SAURASHTRA UNIVERSITY - RAJKOT
# 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-3)

Que – 2 : Sketch and label _____ (Practical-4 & 9) OR

Do as per instruction & show it to examiner.(Practical-6 & 8) [04]

Que – 3 : Solve the given example of Genetics. (Practical- 5)

Any two examples, Each from Coat colour of Rabbit & Blood Group. [04]

Que – 4 : Identify and Describe about comparative account of it. (Practical- 14) [04]

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-8)
(D) Identify and describe. (Practical-10 or 11)
(E) Identify and describe. (Practical-12)
(F) Identify and describe. (Practical-13)

Que – 6 : Tour Report & Viva – voice. [03]

Que – 7 ; Certified Journal. [03]

# SAURASHTRA UNIVERSITY – RAJKOT

## 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-3,(IV)] , Also available in Chart.

(2) All slides of Embryology of Amphioxus. [Practical-4] , Also available in Chart.

(3) Slides of Pathogenic animals-Entamoeba, Trypanosoma, Pin-Worm. [Practical-10]

(4) Slides of harmful Parasitic Insects-Human louse, Bed-bug, Flea [Practical-11]

## LIST OF SPECIMENS:

(1) All animal specimens from Sub-Phylum-Hemichordata to Class- Mammals. [Practical-1&2]

(2) Specimens of pathogenic animals- Filiaria-worm, Guinea-worm, Ascaris. [Practical-10]

(3) Integumentary Derivatives- Glands, Claws, Hoofs, Nails & Horns. [Practical-13], 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-3].

(2) Evolutionary Study of Fossil evidence, Homology and Analogy, Phylogeny of Horse, Darwin's Finches. [Practical-7]

(3) Spermatogenesis & Oogenesis. [Practical-9]

(4) Types of Poultry Farms, Feeder, Brooder & Waterer as Poultry apparatus. [Practical-12], Also available in Instruments.

(5) Integumentary Derivatives- Glands, Claws, Hoofs, Nails & Horns. [Practical-13]

(6) Heart: Origin, Evolution & Comparative account of it. [Practical-14]

## LIST OF INSTRUMENTS/CHEMICALS & MATERIALS:

(1) Light Microscope

(2) Dissection Box, Serum A, Serum B, Serum D, Spirit & Cotton. [Practical-6]

(3) Saliva, Iodine ($I_2$), Starch-Solution, Cavity plate, Dropper.[Practical-7]

(4) Types of Poultry Farms, Feeder, Brooder & Waterer as Poultry apparatus. [Practical-12]

# REFERENCE BOOKS

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

## SEMESTER – II

List of Books for Unit -1


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.Agraval

4 : A manual of practical Zoology, Vertebrates……..P.S.Verma

5 : Practical Zoology, Vertebrates……S.S.Lal


List of Books for Unit - 2


6 : Principal of Genetics……..……..…Gardner.

7 : Genetics…….....P.S.Varma &V.K.Agrawal.

8 : Problems on Genetics, Molecular Genetics & Evolutionary Genetics….
……..…….……..…..Dr. P.K.Banergee.

9 : Genetics & Biostatistics……..……..……..Meyyan.

10 : Cell Biology, Genetics, Molecular Biology, Evolution & Ecology……..P.S.Verma & V.K.Aggarval.

11 : Cytology, Genetics & Evolution……..…P.K.Gupta

12 : Organic Evolution ……..…..Dr. N. Arumugam.

13 : Evolution…….Veerbala Rastogi.


List of Books for Unit - 3


14 : Animal Physiology…….……P.K.Gupta.

15 : Animal Physiology……..V.K.Agrawal.

16 : Animal Physiology……..…M.P.Arora

17 : A textbook of Animal Physiology……..Tyagi Prasum

18 : Human Physiology, Vol- I & II……..…….Chatterjee C.C.

19 : A text book of Animal Physiology…….….A.K.Berry & K.Berry

20 : Animal Physiology & Bio-Chemistry……..R.A.Aggrawal & Anil k. Shrivastva & Kaushal Kumar

21 : Chordate Embryology……P.S.Verma & V.K.Agraval

List of Books for Unit – 4

22 : Applied Zoology……..….Arumugam, T. Murugan, Rajeshwar, Ram Prabhu.

23 : Economic Zoology…….……..…..Shukla &Upadhyay.

24 : Economic Zoology……..Venkitaraman.

List of Books for Unit – 5

25 : Reproductive Physiology…….……A.V.Nalbandow.

26 : Chordate Zoology……...E.L.Jordan & Dr.P.S.Verma

27 : Modern textbook of Zoology Vertebrates ……..…….R.L.Kotpal.

28 : Animal Physiology……..…M.P.Arora

29 : Animal Physiology & Bio-Chemistry……..R.A.Aggrawal & Anil k. Shrivastva & Kaushal Kumar

List of Books for Viva-Voice

33 : Practical Zoology Invertebrate……..S.S.Lal

34 : Practical Zoology Vertebrate…….S.S.Lal

# SAURASHTRA UNIVERSITY

# RAJKOT

Accredited Grade 'A' by NAAC

(CGPA 3.05)

FACULTY OF SCIENCE

[Three Years (6 Semesters) Full Time Course]

# ZOOLOGY SYLLABUS

## WITH EXAMINATION CODING SYSTEM

**17-03-04-01-03-03-00**

**17-03-04-01-04-04-00**

## 2017 - 18

Saurashtra University
University Campus, Rajkot – 360 005.
Gujarat, India.

**-Website: www.saurashtrauniversity.edu**

# 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 & Histology, Animal Behaviour & Economic Zoology, Wild life Biology, Ecology & Instrumental Biology | ( In Sem -IV) Chordate: Systematic, Forms & Functions, Embryology, Physiology &Reproductive Biology, Genetics & Inborn Errors of Metabolism, Evolution, Functional Anatomy of chordates & 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 |

# SAURASHTRA UNIVERSITY

# RAJKOT

## ZOOLOGY

## SYLLABUS

**WITH EXAMINATION CODING SYSTEM**

**17-03-04-01-03-03-00**

**17-03-04-01-04-04-00**

**[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 – 2017**

# SAURASHTRA UNIVERSITY

# RAJKOT

**[SYLLABUS FOR CHOICE BASED CRADIT SYSTEM (CBCS)]**

INFORCE FORM JUNE – 2017

# SUBJECT: ZOOLOGY

## WITH EXAMINATION CODING SYSTEM

**17-03-04-01-03-03-00**

**17-03-04-01-04-04-00**

SEMESTER – III

ZOOLOGY PAPER – Z *– 03

Non Chordate : Systematic, Forms & Functions, Cell Biology & Histology, Animal Behaviour & Economic Zoology, Wild life Biology, Ecology & Instrumental Biology

SEMESTER – IV

ZOOLOGY PAPER – Z – 04

Chordate: Systematic, Forms & Functions, Embryology, Physiology & Reproductive Biology, Genetics & Inborn Errors of Metabolism, Evolution, Functional Anatomy of chordates & Fisheries Biology

# FORWARD

Renewing and updating of the Curriculum is the prime important criteria in the University education system.

Syllabus provides an educational guide line and demarks the horizon of a subject. Syllabus of different Theory and Practical papers should have subjective harmony and gradual relationship within periphery of a subject.

Formulation of Curriculum for a particular subject requires the following criteria.

(A) Background of previous Curriculum.
(B) Relationship with other related subjects.
(C) Resources of Educational needs at regional level as well as national level.
(D) Financial and Statuary provisions of the State government.

All the above criteria are taken into consideration in formulation of this Curriculum.

This Curriculum is the result of prolonged discussions among the experienced teacher in this subject because after all, the college teachers are the real catalysts for implementation of this Syllabus.

The proposed Syllabus after required formalities will be implemented in the second year B.Sc.

Valuable guidelines and all facilities in this curriculum are provided by the authorities of the Saurashtra University, Rajkot.

**DR. CHIRAG M GOSAI**
Chairman,
Board of Studies, Zoology,
Saurashtra University,
Rajkot – 360 005.

**DR. B B RADADIYA**
Other Than Chairman,
Board of Studies, Zoology,
Saurashtra University,
Rajkot – 360 005.

# SAURASHTRA UNIVERSITY

RAJKOT

(CBCS Syllabus)

## SEMESTER – III

## ZOOLOGY

## 17-03-04-01-03-03-00

## PAPER – Z-03

Non Chordates : Systematics, Forms & Functions, Cell biology & Histology, Animal behaviour & Economic Zoology, Wild life Biology, Ecology & Instrumental Biology

## 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 PORIFERA:**

(i) General account of Canal System in Sponge

(ii) Economic Importance of Sponge.

**2.2** General structures and morphology with functional anatomy of following type

**ANNELIDA: Type Study: Leech**

**2.3 ARTHROPODA:**

(i) Peripatus is as connecting link between Annelida & Arthropoda.

(ii) Different type of Mouth parts in Insects.

1. Chewing & Bitting 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 HISTOLOGY

**3.1 CELL BIOLOGY: Only Structure and Function of following organelles.**
(i) Golgi Complex
(ii) Ribosome
(iii) Lysosme
(iv) Centrioles & Basal Bodies

**3.2 HISTOLOGY: Histological structure and function of following organs of Mammals.**
(i) Pitutary
(ii) Thyroid
(iii) Adrenal
(iv) Kidney

## UNIT – 4: ANIMAL BEHAVIOUR & ECONOMIC ZOOLOGY

**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
(ii) Alytes

**4.4 Household Insects:**
(i) Insect affecting Human health: 1. Tse-Tse Fly, 2. House Fly. 3. Mosquito
(ii) Insect damaging Food Products: 1. Rice Weevil, 2. Wheat Weevil
(iii) Insect damaging Household Goods: 1. Termite, 2. Silver Fish, 3. Cricket
(iv) Insects damaging Storage grains: 1. Tribolium, 2. Pulse bettle

(v) Pest of Crop: 1. Brinjal Fruit & Shoot Borer, 2. Cabbage Butterfly, 3. Rice bug

**4.5 Insect Pest Management:**
(i) Cultural Control
(ii) Biological Control
(iii) Chemical Control

## UNIT – 5: WILD LIFE BIOLOGY, ECOLOGY & INSTRUMENTAL BIOLOGY

**5.1 Wildlife in India & its Conservation**

**5.2 Reasons for depletion OF Wild-life**

**5.3 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 |

**5.4 Threatened Wild animals of India:**
(i) Mammals: Slender Loris, Black Nilgiri Langur, Cheetah, Asiatic Lion, Tiger, Snow leopard
(ii) Birds: Pink Headed Duck, Himalayan Golden Eagle, Peacock, Great Indian Bustard, Greater Flamingo, Vulture

**5.5 Ecology:**
(i) Energy Flow in Eco-system
(ii) Ecological pyramids

**5.6 Instrumental Biology:**
(i) Phase Contrast Microscope
(ii) Haemoglobino Meter
(iii) Sphygmomanometer

# PRACTICALS RELATED TO PAPER – Z-03

**Practical: 1 :** Identification and classification of Invertebrate animals

(i) Phylum: Protozoa : Noctiluca, Amoeba, Plasmodium, Opelina, 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, Moniezia Expansa

(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) Lysosme
(iv) Centrioles & Basal Bodies

**Practical: 9 :** To Study Histological Structure of Mammalian Organs:
(i) Pitutary
(ii) Thyroid
(iii) Adrenal
(iv) Kidney

**Practical: 10 :** To Study Animal Behaviours:
**1. Social Behaviour:**
(i) Honey bee
(ii) Termite
**2. Courtship & Reproductive Behaviour:**
**(**i) Spider
(ii) Scorpion
(iii) Peacock
**3. Parental Care Behaviour:**
(i) Arius
(ii) Ichthyophis
(ii) Alytes

**Practical: 11 :** To Study Hosehold Insect:
(i) Insect affecting Human health: 1. Tse-Tse Fly, 2. House Fly. 3. Mosquito
(ii) Insect damaging Food Products: 1. Rice Weevil, 2. Wheat Weevil
(iii) Insect damaging Household Goods: 1. Termite, 2. Silver Fish, 3. Cricket
(iv) Insects damaging Storage grains: 1. Tribolium, 2. Pulse bettle
(v) Pest of Crop: 1. Brinjal Fruit & Shoot Borer, 2. Cabbage Butterfly, 3. Rice bug

**Practical: 12 :** To Study apparatus for collecting and killing method:
(i) Insect Net
(ii) Aspirator
(iii) Killing Jar

**Practical: 13 :** To Study National Parks and Sanctuaries of India:
(i) Vansda National Park
(ii) Velavadar National Park
(iii) Ratanmahal Sloth bear Sanctuary
(iv) Shoolpaneshwar Wild life Sanctuary

**Practical: 14 :** To Study Threatened Wild animals of India:
(i) Mammals: Slender Loris, Black Nilgiri Langur, Cheetah, Asiatic Lion, Tiger, Snow leopard
(ii) Birds: Pink Headed Duck, Himalayan Golden Eagle, Peacock, Great Indian Bustard, Greater Flamingo, Vulture

- by photograph, Chart, stuffed animals or multimedia.

**Practical: 15 :** To Study Principle, Structure & Function of Following Instruments:
(i) Phase Contrast Microscope
(ii) Haemoglobino Meter
(iii) Sphygmomanometer

**Practical: 16 :** Visit to any one National Park or Sanctuary OR Reserve forest area.

# DISTRIBUTION OF UNITS

## 17-03-04-01-03-03-00

SEMESTER – III

**PAPER – Z-03**

| Unit No. | Unit Title | Theory Period | Marks. |
|---|---|---|---|
| **Unit : 1** | **Systematic** | 10 | 14 |
| **Unit : 2** | **Forms and Functions** | 18 | 14 |
| **Unit : 3** | **Cell Biology and Histology** | 10 | 14 |
| **Unit : 4** | **Animal behaviour & Economic Zoology** | 15 | 14 |
| **Unit : 5** | **Wild life Biology, Ecology & Instrumental Biology** | 12 | 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 units are carries equal 14 marks.
- Total marks for theory examination are 70 marks.
- **PAPER SETTER MUST FOLLOW THE UNIT WISE MARK SETUP.**

# SAURASHTRA UNIVERSITY - RAJKOT
# THEORY EXAMINATION

## SEMESTER – III

## ZOOLOGY

## 17-03-04-01-03-03-00

(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 carries1 Marks.

**(1)**

**(2)**

**(3)**

**(4)**

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

Each Question carries2 Marks.

**(1)**

**(2)**

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

Each Question carries3 Marks.

**(1)**

**(2)**

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

Each Question carries5 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]**

# SAURASHTRA UNIVERSITY - RAJKOT
# PRACTICAL EXAMINATION

**SEMESTER – III**

**ZOOLOGY**

## 17-03-04-01-03-03-00

(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 – 15)

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-9)
(E) Identify and describe (Practical-10)
(F) Identify and describe (Practical-11/12)
(G) Identify and describe (Practical-13/14)

Que. – 5: Report and Viva-voice. [03]

Que – 6: Certified Journal. [03]

# SAURASHTRA UNIVERSITY – RAJKOT

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

**SEMESTER – III**

**ZOOLOGY**

## 17-03-04-01-03-03-00

(Based on Paper – Z-03)

## LIST OF SLIDES:

(1) All animals from Protozoa. [Practical-1, ( i)]

(2) Obelia, Schistosoma, Enterobius vermicularis, Filaria worm [Practical-2, (i), (ii), (iii)]

(3) Mountings of Leech [Practical-6]

(4) Mouth Parts of Insects. [Practical-7]

(5) Histological Structure of mammalian organs. [Practical-9]

(6) Termite [Practical-10, (i)]

(7) Tse-Tse Fly, Mosquitoe, Rice Weevil, Wheat Weevil, Tribolium, Pulse bettle, Rice bug [ Practical-11, (i), (ii), (iv), (v)]

## LIST OF SPECIMENS:

(1) All animal specimens from Phylum- Porifera to Phylum-Hemichordata. [Practical-1 to Practical-4, except Practical-1, (i) & Obelia, Schistosoma, Enterobius vermicularis, Filaria worm ]

(2)Animal Behaviour & Household Insects [Practical-10 & 11 except Termite, Tse-Tse Fly, Mosquito, Rice Weevil, Wheat Weevil Tribolium, Pulse bettle Rice bug]

## LIST OF CHARTS/MODELS/PHOTOGRAPHS:

(1) Systems of Leech. [Practical-5]

(2) Cell Organelles. [Practical-8]

(3) Aapparatus for collecting and killing method [Practical-12]

(4) National Parks & Sanctuaries of Gujarat State &Threatened Mammals and Birds. [Practical-13 & 14]

## LIST OF INSTRUMENTS:

[Practical-15]

(i) Phase Contrast Microscope

(ii) Haemoglobino Meter

(iii) Sphygmomanometer

# REFERENCE BOOKS

# 17-03-04-01-03-03-00

## 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 Zoology……... N Arumugam

21 : Applied Zoology…… Nagendra S Pawar

22 : Applied Emtomology……. P G Fenemore

23 : Indian National Parks and Sanctuaries……...…..…Khati &Annand S.

24 : Modern textbook of Zoology Vertebrates…….R.L.Kotpal

25 : Vertebrate Zoology…….….E.L.Jordan & Dr.P.S.Verma

26 : Practical Zoology Vertebrate…….S.S.Lal

27 : 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. Arumugam

31 : Elements of Ecology……....Robert & Thomas.

32 : Environmental Biology……...P.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

# SAURASHTRA UNIVERSITY
# RAJKOT
(CBCS Syllabus)
## SEMESTER - IV
## ZOOLOGY
## 17-03-04-01-04-04-00

## PAPER – Z-04

Chordate: Systematic, Forms & Functions, Embryology, Physiology & Reproductive Biology, Genetics & Inborn Errors of Metabolism, Evolution, Functional Anatomy of chordates & Fisheries Biology

### UNIT- 1: SYSTEMATIC:

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

**1.2** Archaeopteryx as a connecting link between Reptiles and Aves.

**1.3** General account of Ratitae

**1.4** Platypus as connecting link between Aves & Mammals.

### UNIT- 2: FORMS AND FUNCTIONS IN ANIMALS::

**2.1 PISCES:** General account of Migration in Fishes:
(i) Anadromous Type
(ii) Catadromous Type

**2.2** General structure and morphology with functional anatomy of following type.
**REPTILE: Type Study – Calotes**

**2.3** Difference between Poisonous & Non-Poisonous snakes.

**2.4** 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. Russel's Viper, 9. Echis carinata

**2.5** Snake bite, Anti-Venum, Preventive measures and First aid Treatment.

## UNIT- 3: EMBRYOLOGY, PHYSIOLOGY &REPRODUCTIVE BIOLOGY:

### 3.1 EMBRYOLOGY:

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

### 3.2 EXCRECTION:

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

### 3.3 REPRODUCTIVE BIOLOGY:

(i) Manopause
(ii) Hormones of Ovary & Testis

## UNIT- 4: GENETICS & INBORN ERRORS OF METABOLISM:

### 4.1 GENETICS:

(i) Structure of Chromosome
(ii) Types of Chromosome according to Centromere
(iii) Human Chromosome and Karyotyping
(iv) Giant Chromosome:
1. Polytene Chromosome
2. Lampbrush Chromosome
(v) DNA Finger printing
(vi) Sex Determination in Drosophila, Human being and Bonelia
(vii) Cytoplasmic Inheritance:
1. Kappa Particles in Paramecium
2. 4 O' Clock Mirabilis Jalapa

### 4.2 INBORN ERRORS OF METABOLISM:

(i) Phenylketonuria (PKU)
(ii) Alkaptonuria
(iii) Albinism

(iv) Sickle-Cell anemia

## UNIT-5: EVOLUTION, FUNCTIONAL ANATOMY OF CHORDATES & FISHERIES BIOLOGY

### 5.1 EVOLUTION:

(i) Origin and Evolution of Earth
(ii) Isolation
(iii) Speciation
(iv) Evolution of Man
(v) Morphological & Comparative anatomy of Homologous and Analogous Organs.
(vi) Vestigial Organs of Human

### 5.2 FUNCTIONAL ANATOMY OF CHORDATES:

(i) Circulatory System: Origin & Evolution of Aortic arch

### 5.3 FISHERIES BIOLOGY:

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

# PRACTICALS RELATED ON PAPER – Z-04

**Practical: 1 :** Identification and classification of Chordate animals.

(i) Sub-Phylum : Urochordata : Ascidia, Doliolum, Oikopleura
(ii) Sub-Phylum: Cephelochordata : 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, Sphenodon, Phrynosoma, Cobra, Crocodylus(Muggar), Gavialis(Ghariyal), 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 Catoles :

(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 Archaeopteryx as connecting link between Reptiles & Aves :

-By charts or Multimedia.

**Practical: 7 :** To Study Migration in Fishes:

(i) Anadromous Type : Salmon
(ii) Catadromous Type ; Eel

**Practical: 8 :** To Study diference between Poisonous & Non-Poisonous Snakes.
1. Rat Snake, 2. Python, 3. Sand Boa, 4. Hydrophis, 5. King Cobra, 6. Cobra, 7. Krait, 8. Russel's Viper, 9. Echis carinata

**Practical: 9 :** To study types of eggs according to Yolk.

**Practical: 10 :** To study types of Cleavage.

**Practical: 11 :** To study types of Chromosomes according to Centromere.

**Practical: 12 :** To study Giant Chromosome.

**Practical: 13 :** To Study Human Chromosome & Its Karyotyping.

**Practical: 14 :** To study Evolution of Man.

**Practical: 15 :** To Study Haemologus & Analogus organs.

(i) Talpa
(ii) Flying Fox
(iii) Rhesus Monkey
(iv) Whale
(v) Horse
(vi) Ichthyophis
(vii) Blind Snake

**Practical: 16 :** To Study comparative account of aortic arches.

**Practical: 17 :** To study of Important fisheries:
(i) Pomfret
(ii) Bombayduck
(iii) Prawn
(iv) Lobster
(v) Pearl Oyster

# DISTRIBUTION OF UNITS

## 17-03-04-01-04-04-00

SEMESTER – IV

| PAPER – Z-04 | | | |
|---|---|---|---|
| **Unit No.** | **Unit Title** | **Theory Period** | **Marks.** |
| **Unit : 1** | **Systematic** | 10 | 14 |
| **Unit : 2** | **Forms and Functions** | 17 | 14 |
| **Unit : 3** | **Embryology, Physiology & Reproductive Biology** | 11 | 14 |
| **Unit : 4** | **Genetics & Inborn Errors of Metabolism** | 16 | 14 |
| **Unit : 5** | **Evolution, Functional Anatomy of chordates & Fisheries Biology** | 11 | 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 units are carries equal 14 marks.
- Total marks for theory examination are 70 marks.
- **PAPER SETTER MUST FOLLOW THE UNIT WISE MARK SETUPS.**

# SAURASHTRA UNIVERSITY - RAJKOT
# THEORY EXAMINATION

## SEMESTER – IV

## ZOOLOGY

## 17-03-04-01-04-04-00

(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 carries1 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]**

# SAURASHTRA UNIVERSITY - RAJKOT
# PRACTICAL EXAMINATION

## SEMESTER – IV

## ZOOLOGY

## 17-03-04-01-04-04-00

(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 : Identify and Describe about comparative account of it.
(Practical- 16) [04]

Que – 4: Do as per instruction and show it to examiner [03]

(Practical – 11/12/13)

Que – 4 : Write as per instruction. [14]

(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)
(E) Identify and describe. (Practical- 9/10)
(F) Identify and describe. (Practical-14/15)
(G) Identify and describe. (Practical- 17)

Que – 6 : Viva – voice. [03]

Que – 7 : Certified Journal. [03]

# SAURASHTRA UNIVERSITY – RAJKOT

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

**SEMESTER – IV**

**ZOOLOGY**

## 17-03-04-01-04-04-00

(Based on Paper – Z-04)

## LIST OF SLIDES:

(1) Doliolum, Oikopleura [Practical-1,(i)]

(2) Mountings [Practical-5], Also available in Chart.

(3) Types of eggs according to Yolk [Practical – 9]

(4) Types of Cleavage. [Practical – 10]

(5) Giant Chromosome. [Practical – 12]

## LIST OF SPECIMENS:

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

(2) Salmon & Eel [Practical-7]

(3) Snakes [Practical-8]

(4) Homologus & Analogus Organs[Practical-15]

(5) Fisheries [Practical-17]

## LIST OF CHARTS/MODELS/PHOTOGRAPHS:

(1) Systems of Calotes [Practical-4]

(2) Archaeopteryx [Practical-6]

(3) Types of Chromosome according to centromere [Practical-11]

(4) Giant Chromosomes [Practical-12]

(5) Human Chromosomes & Its Karyotyping [Practical-13]

(6) Evolution of Man [Practical-14]

(7) Aortic arches: Origin, Evolution & Comparative account of it. [Practical-16]

# REFERENCE BOOKS

# 17-03-04-01-04-04-00

## SEMESTER – IV

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.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……..……...……..Tyagi Prasum

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.Banergee.

17 : Genetics & Biostatistics……..……..……..Meyyan.

18 : Cell Biology, Genetics, Molecular Biology, Evolution & Ecology……..P.S.Verma & V.K.Aggarval.

19 : Cytology, Genetics & Evolution…….……..…P.K.Gupta


List of Books for Unit – 5


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

21 : Evolution……..…….Veerbala Rastogi.

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

23 : 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

# SAURASHTRA UNIVERSITY


## Choice Based Credit System (CBCS) Syllabus
## For
## Semester V & VI "ZOOLOGY"

**Semester – V**

**Paper No.-501 : Functional Anatomy of Non-chordates**
**Paper No.-502 : Fisheries biology, Animal Husbandry, Wild life, Biotechnology, Toxicology**
**Paper No.-503 : Biochemistry, Cytology, Instrumentation Biology, Genetics, Fundamental Processes**

**Semester – VI**

**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, Embryology, Evolution, Environmental Pollution and Ecology**

**INFORCE FROM JUNE - 2018**

# FOREWORD

Renewing and updating of the curriculum is the ingredient of any vibrant university academic system. Revising the curriculum should be a continous process to provide an updated education to the students at large. To meet the need and requirement of the society and in order to enhance the quality and standards of education, updatind and restructuring of the curriculum must continue as a perpetual process. Accordingly our saurashtra university has implemented the Choice Based Credit System (CBCS) which is word wide applicable for the benefit of the students. As a part of duty of study board, we the member of zoology study board designed the new curriculum for third year (i.e. sem V & VI) zoology students. For desining of the curriculum we followed the UGC guideline for modelcurriculum. The excersice would not have been possible without the support of ourrespected feculties of zoology. We hope that the results will fulfil expectations of the society.

# SAURASHTRA UNIVERSITY, RAJKOT

## Revised syllabus of B.Sc. Semester V and VI Zoology as per UG guidelines Effective from June 2018

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.

| | |
|---|---|
| **501** | **Functional Anatomy of Non-chordates** |
| **502 :** | **Fisheries biology, Animal Husbandry, Wild life, Biotechnology, Toxicology** |
| **503 :** | **Biochemistry, Cytology, Instrumentation Biology, Genetics, Fundamental Processes** |
| **601 :** | **Functional Anatomy of Chordates and comparative study** |
| **602 :** | **Cardiovascular system, Respiration and Muscular System, Endocrinology and Reproduction, Immunology and Sense organ and Histology** |
| **603 :** | **Reproductive physiology, Embryology, Evolution, Environmental Pollution and Ecology** |

## 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 and four surprise quizes should be attended by the students. 10 marks for assignments and 10 marks for quize 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 evaulation 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 | | |
|---|---|---|---|---|
| 1 | Title Of Paper | 501 | 502 | 503 |
| 2 | Theory Credit | 4 | 4 | 4 |
| 3 | Practical Credit | 3 | 3 | 3 |
| 4 | Total Credit | 7 | 7 | 7 |
| 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 Practical | 15 | 15 | 15 |
| 10 | Total Marks Of Practical | 50 | 50 | 50 |
| 11 | Grand Total | 150 | 150 | 150 |
| 12 | External Exam Time Duration | 2½ Hours | 2½ Hours | 2½ Hours |

| Sr. No. | Name Of Programme | B.Sc. ZOOLOGY | | |
|---|---|---|---|---|
| 1 | Title Of Paper | 601 | 602 | 603 |
| 2 | Theory Credit | 4 | 4 | 4 |
| 3 | Practical Credit | 3 | 3 | 3 |
| 4 | Total Credit | 7 | 7 | 7 |
| 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 Practical | 15 | 15 | 15 |
| 10 | Total Marks Of Practical | 50 | 50 | 50 |
| 11 | Grand Total | 150 | 150 | 150 |
| 12 | External Exam Time Duration | 2½ Hours | 2½ Hours | 2½ Hours |

# 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 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).**

**B.Sc**

**Zoology Syllabus**

**Semester V 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 upto order

[A] Phylum : Arthropoda - Type study- Scorpion

[B] Phylum : Mollusca - Type study- Sepia

**Unit-3 Invertebrate Part I ( Protozoa to coelenterates )**

**3.1 Protozoa**: Nutrition, Reproduction and Locomotion, Parasitic protozoans of man with reference to diagnostic characters, mode of infection and diseases caused (Plasmodium, Paramecium and Leishmania).

**3.2 Porifera**: Skeleton, Reproduction and sponge industry

**3.3 Coelenterata**: Coral, coral reefs and polymorphism

**Unit -4 Invertebrate Part II ( Platyheleminthes 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, Ancyclostoma (Hook worm), Ascaris

**4.3 Annelida**: Metamerism and its significance

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

**Unit-5 Invertebrate Part III ( Mollusca to Hemichordata )**

**5.1 Mollusca**: Foot in Mollusca, Torsion and Detorsion.

**5.2 Echinodermata**: Larval forms, water vascular system

**5.3 Hemichordata**: Affinities(Balanaglossus), Tornaria larvae

**B.SC.**

**Zoology Practical Syllabus**

**Semester-V**

**Practical -1**

**Based on Paper-Z-501**

**Unit-1 Identification and classification upto 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, Ancyclostoma, 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**: Anthena, 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 [4] Reproductive System

**Mounting:**

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

Part II Sepia and Star fish [1] Ink-Gland [2] Tube feet

**Unit 3: Preparation from preservative material**

Protozoa: Balantidium,Opelina,Vorticella.

Porifera: Sponge,Spicules.

Coelenterata : Hydra with bud,Obelia medusa.

Platyhelminthes: Tape worm ova.

Nemathelminthes: Ascaris ova

Mollusca: Glochedium larvae.

Hemichordata: Tornaria larvae.

**Unit 4 A study of permanent slides and important specimens.**

Part 1 Conjugation in paeamoecium,Obelia hydranth in L.S.,Obelia gonagium, T.S. of Leech.

Part 2 (a) Naupleus larvae,Meta napleus 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,

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

## PRACTICAL INDEX

### Practical no 1 Based on PaperZ-501

(1) Classification of Protozoa

(2) Classification of Porifera and Coelenterata

(3) Classification of Platyhelmenthes & Aschelminthes

(4) Classification of Annelida

(5) Classification of Arthropoda

(6) Classification of Mollusca

(7) Classification of Echindermata & Hemichordata

(8) To study external features and digestive system of scorpion

(9) To study nervous system and reproductive system of scorpion

(10) To study mounting of pectin, of book-lung and all appendages of scorpion

(11) To study external feature and water vascular system of star-fish

(12) To study external features and digestive system of sepia

(13) To study nervous system of sepia

(14) To study mounting of Ink-Gland of sepia and Tube feet of Star fish

(15) Preparation from preservative material- Protozoa & Porifera

(16) Preparation from preservative material- Coelenterata & Helminthes

(17) Preparation from preservative material- Mollusca & Hemichordata

(18) A study of permanent slide and important specimen-Part I

(19) A study of permanent slide and important specimen-Part II

(20) 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** | **05** |
| **Unit 2** | **Forms and Functions in Animals** | **14** | **18** |
| **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**

**Zoology Practical Exam Skeleton**

**Practical Paper No.1 Semester V**

**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 8,9,11,12 and 13 ) (08 )**

**Que:2 Make a temporary mounting of _____from the given animal. ( 03 )**
**( Practica-10 and 14 )**

**Que:3 Make a temporary preparation from the given material. Stain it if necessary,**
**Identify and show it to the examiner. (04)**
**( Practical-15, 16 and 17 )**

**Que:4 Sketch and label as per instruction. (05)**
**( Practical-19(a) and 20 (a) Only Larva)**

**Que:5 Write as per given instruction. (12)**

**(1) Identify and classify giving reason ( Lower invertebrate )**
**(2) Identify and classify giving reason ( Higher invertebrate )**
**(3) Identify and Describe ( Practical-18)**
**(4) Identify and Describe. ( Practical-19(b))**
**(5) Identify and Describe. ( Practical-20(b))**

**Que:6 Certified Journal. (03)**

**Que:7 Viva Voce (02)**

**B.SC**

**Zoology Syllabus**

**Semester V**

**Paper-Z-502**

**Fisheries biology, Animal Husbandry, Wild life, Biotechnology, Toxicology**

## Unit-1 Fisheries Biology

1.1Basis of Aquaculture.

1.2Inland fishiries and fish pond

1.3Induced breeding

1.4Nutrition in fish

1.5Fish feed

1.6Fish Diseases

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

1.7Fish By product

1.8Post harvesting Techniques in fisheries

## Unit-2 Animal Husbandary

### 2.1 Apiculture

Life cycle of honey bee

Behaviour

Procedure of apiculture

Application

### 2.2 Sericulture

Life history

Rearing of silk worm

## Unit -3 Wild life

3.1 Hotspots of biodiversity

3.2 Endangered and endemic species of india

3.3 Keystone species

3.4 Insitu and Exsitu 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 Biotechnology**

4.1 Introduction

4.2 Vectors ( YAC, BAC, Plasmid, Bacteriophage )

4.3 Restriction Enzymes

4.4 General introduction of cloning

**Unit-5 Toxicology**

5.1 Introduction of toxicology

(a) Classification of toxicants

(b) Characteristics of Exposure

5.2 Absorption: from the site of exposure to the target

5.5 Metal as toxicants ( Arsenic, Flouride and Lead )

**B.SC.**

**Zoology Practical Syllabus**

**Semester-V**

**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 techniques in fisheries

## Unit-2 Animal Husbandary

Part 1 Apiculture

(a) Life cycle of Honey Bee

Part 2 Sericulture

(b) Life cycle of silkworm

## 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)

3.3 Endemic Species of india

(a) Amphibia and Reptiles : Indian bull frog, tree frog, Gharial, Star tortoise

(b) Birds : Paradisc Flycather, Bee eater, Flamingo, Great Indian bustard

(c) Mammals : Chital, Barasingha, Hangul deer, Lion tailed macaque

**Unit-4 Biotechnology**

4.1 To make a culture of Ecoli

4.2 Vectors by chart

4.3 Micro organism by slide preparation

(a) Yeast

(b) Bacteria (from stain method)

**Unit-5 Toxicology**

5.1 Effect of toxicants on human body

.

## 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 in fisheries
6. To study life-cycle of Honey bee
7. To study life-cycle of silkworm
8. To study foot print of wild animals
9. To study national parks of India
10. To study Wild life sanctuaries of India
11. To study endemic amphibian and reptilian species of india
12. To study endemic Avian species of india
13. To study endemic Mammalian species of india
14. To study Preparation of culture of E.coli
15. To study Vectors by chart
16. To study microorganism by slide preparation(Yeast & Bacteria)
17. To study effect of Arsenic on human body ( chart/Photographs)
18. To study effect of Fluoride on human body ( chart/Photographs)
19. To study effect of Lead on human body ( chart/Photographs)
20. 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 --Mihir Suthar

(12)Elements of Bio-technology --P.K.Gupta

(13)Molecular Biology & Biotechnology --R.A.Meyers

(14)Biotechnology --Keshav Trehan

(15)Fundamentals of computers --V.Rajaraman

(16)Fish & Fisheries --Pandey & Shukla

(17)

**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** | **Wild life** | **14** | **20** |
| **Unit 4** | **Biotechnology** | **14** | **10** |
| **Unit 5** | **Toxicology** | **14** | **17** |

**B.SC**

**Zoology Practical Exam Skeleton**

**Practical Paper No.2 Semester V**

**Based on Paper—Z502**

**Time : 3 Hrs** **Total- 35 Marks**

**Que:1 Write as per instruction.** **(22)**

**(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 give its economic importance ( Practical-3)**

**(6) Identify and describe ( Practical-11, 12, and 13 )**

**(7) Identify and Describe ( Practical-14 and 15 )**

**(8) Identify and comment on economical importance ( Practical-6 and 7 )**

**(9) Identify and describe ( Practical-8)**

**(10) Identify and describe ( Practical-9 and 10)**

**(11) Identify and describe ( Practical- 17, 18 and 19)**

**Que:2 Make a temporary slide of microorganism ( Practical-16)** **(03)**

**Que:3 Report of study tour** **(05)**

**Que:4 Viva-voce** **(02)**

**Que:5 Certified Journal** **(03)**

**B.SC**

**Zoology Syllabus**

**Semester V**

**Paper-Z-503**

**Biochemistry, Cytology, Instrumentation Biology, Genetics, Fundamental Processes**

## Unit-1 Biochemistry

### 1.1 Carbohydrates

Classification and structure of carbohydrate

Metabolisms of carbohydrates

(a) Glycolysis

(b)Glyconeogenesis

Importance

### 1.2 Proteins

Classification of proteins and amino acids

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

Urea cycle

### 1.3 Enzymes

### 1.4 Importance of vitamins

### 1.5 Importance of minerals

## Unit-2 Cytology

2.1 Cytoskelton

2.2 Cell cycle

2.2 Cancer

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

2.3 Possible causes of cancerous growth of Carcinogenesis by

• Mutation theory (2) Virus theory (3) Metabolic theory (4) Hormonal disturbance theory (5) Irritation theory.

## Unit 3 Instrumentation biology

3.1 Electrophoresis

3.2 Recombinant DNA technology

3.3 Chromatography

(1) Introduction (2) Paper chromatography

**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 sexes and diagnosis (amniocentesis)

4.4 Human hereditary traits ( pedigree analysis )

(Colour blindness, Haemophilia, ear pinna).

**Unit-5 Fundamental Processes**

(a) DNA Replication

(b) Transcription

(c) Translation

**B.SC.**

**Zoology Practical Syllabus**

**Semester-V**

**Practical -3**

**Based on Paper-Z-503**

**Unit-1 Biochemistry**

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

**Unit-2 Instrumentation biology**

- Detection of amino acids by paper chromatography
- 2D-SDS gel Electrophoresis

Production of human insulin by chart

**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

- Transmission of Y linked dominate trait.

**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. Detection of amino acid by paper chromatography
8. To study SDS electrophoresis
9. To study production of human insulin by chart
10. Temporary preparation of mitosis cell-division from onion root-tip
11. Temporary preparation of mieosis cell-division from bud of Tradenschantia
12. Temporary preparation of barr body
13. To study of giant chromosome from mounting of salivary gland of chironomous larva/Drosophilla
14. To study of permanent slide of cell-differentiation
15. To study a transmission of autosomal recessive trait (eg:- Thalassemia )
16. To study transmission of sex-linked chromosome trait (eg:- Red-greenclour blindness)
17 To study tranmission of Y-linked dominant trait
18. To study process of DNA replication by chart
19. To study process of transcription by chart
20. 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) GeneVII ----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** | **14** | **18** |
| **Unit 2** | **Cytology** | **14** | **12** |
| **Unit 3** | **Instrumentation biology** | **14** | **10** |
| **Unit 4** | **Genetics** | **14** | **18** |
| **Unit 5** | **Fundamental processes** | **14** | **12** |

**B.SC**

**Zoology Practical Exam Skeleton**

**Practical Paper No.3 Semester V**

**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 7 to 9 )** **(08)**

**Que:3 Make a temporary stain preparation of _____ as per examiner instruction. ( Practical 10 to 12 ) (06)**

**Que:4 Write as per given instruction (10)**

**(1) Identify and describe ( Practical 13 and 14 )**

**(2) Identify and describe ( Practical 15 to 17 )**

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

**(4) Identify and describe ( Practical 18 to 20 )**

**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

[B] Mammals- Rat

**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, types of fins in fishes, 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** :- Migration in birds

Types of beaks and claws

Different feathers in birds

**4.3 Mammals** :- Egg laying mammals (Monotremes)

Pouched mammals (Marsupials)

Placental mammals- Chiroptera, Primates, Carnivore, cetacean.

**Unit-5 Comparative anatomy of chordates**

5.1 Comparative study :Digestive system

5.2 Comparative study :Excretory system

5.3 Nervous system :- Evolution of brain

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 :- Digestive system,

Arterial system

Venous system

Reproductive system

Brain (By chart)

2.2 Rat :- Digestive system,

Arterial system

Venous system

Reproductive system

Brain (By chart)

2.4 Mounting:- Straited muscles, blood, Pectin

**Unit-3 Preparation from preservative materials**

3.1 Amphioxus

3.2 Doliolum

3.3 Salpa

3.4 Filoplume feather

3.5 Down feather

3.6 Placoid scales

3.7 Cycloid scales

3.8 Ctenoid scales

**Unit-4 General Practicals**

4.1 Parental care in fishes:- Amia, Hippocampus

4.2 Migration in fishes:- Salmon, Hilsa

4.3 Fins in fishes

4.4 Sphenodon by chart or model

4.5 Different types of feathers in pigeon

4.6 Archeopteryx by chart or model

**Unit-5 Comparative Anatomy**

5.1 Digestive system

5.2 Excretory system

5.3 Brain

5.4 Dentition in mammals:- Dog, Pig, Goat, Horse,

## PRACTICAL INDEX

### Practical no 1 Based on PaperZ-601

1. Classificaiton of protochordata to Amphibia
2. Classificaiton of reptiles to mammals
3. To study digestive system, arterial , venous, brain, reproductive systemof Pigeon
4. To study digestive system, arterial , venous, brain, reproductive system of rat
5. To study mountings of rat ( Striated muscle and blood and pectin )
6. Preparation from preservative materials Part I
7. Preparation from preservative materials Part II
8. To study parental care in fishes
9. To study migration in fishes
10 To study fins in fishes
11. To study sphenodon through chart or model
12. To study Temporal fosse
13.To study different types of feather in pigeon
14.To study types of beaks and claws in birds
15. To study Archaeopteryx by chart or model
16.To study a comparative account of excretory system
17.To study a comparative account of digestive system
18.To study a comparative account of Brain
19.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 ) (07)**

**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- 16 to 18 ) (04)**

**Que:4 Make a temporary prepariation from given material.Stain it if necessary,Identify and show it to examiner (Practical- 6 and 7 )**

**(05)**

**Que:5 Write as per given instructions: (12)**

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

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

**(3) Identify and describe (Practical-8 to 10 )**

**(4) Identify and describe (Practical-11 to 12)**

**(5) Identify and describe (Practical-13 to 15 )**

**(6) Identify and describe (Practical-19)**

**Que:6 Viva-voce (02)**

**Que:7 Certified Journal (02)**

**B.SC**

**Zoology Syllabus**

**Semester VI**

**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

**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) Toludine blue

(d) Methyl blue

(e) Acetocarmine

2.4 Histological structure

(a) Adrenal gland

(b) Ovary

(c) Testis

**B.SC.**

**Zoology Practical Syllabus**

**Semester-VI**

**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

6.1 Collection of tissue and fixation

6.2 Washing in running tap water

6.3 Dehydration

6.4 Dealcoholization (clearing)

6.5 Embedding

6.6 Block preparatioon

6.7 Sectoning

6.8 Staining and mounting6.9 Identification and naming of slides

## PRACTICAL INDEX

### Practical no 2 Based on PaperZ-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. To study process of making a permanent histological slides by single stain method
10. To study process of making a permanent histological slides by double stain method
11. A study of histological structure through permanent slides
12. Obtaining the tissue and fixation
13. To wash in running tap-water
14. Dehydration
15. De-Alcoholization(clearing)
16. Embedding
17. Block preparation
18. Sectioning
19. Staining and mounting
20. Identificaiton 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 --Copenharver bunga&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 an 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 (Practical-**

**Ques:5 Submission of permanent slide (05)**

**Que:6 Viva-voce (02)**

**Que:7 Certified Journal (02)**

**B.SC**

**Zoology Syllabus**

**Semester VI**

**Paper-Z-603**

**Reproductive physiology, Embryology, Evolution, Environmental pollution and Ecology**

**Unit 1 Reproductive physiology**

1.1 Structure and function of mammalian ovum

1.2 Structure and function of mammalian sperm

1.3 Structure of mammary gland

**Unit 2 Embryology**

2.1 Parthenogenesis in general

2.Fertilization and Embryonic development of chick upto 72 hrs

Cleavage, blastula, gastrula and upto 72 hrs

2.4 Placenta and placentation

2.5 Regenration

**Unit 3 Evolution**

3.1 Zoo geographical distribution

3.2 Macro and micro evolution

3.3 Geological Period

3.4 Gene pool, Gene flow and Genetic Drift

**Unit 4 Environmental pollution**

4.1 Air pollution

4.2 Water pollution

4.3 Soil pollution

4.4 Green house effect

**Unit 5 Ecology**

5.1 Ecological Succession

5.2 Energy flow

5.3 Bio-geochemical cycle- O2, N2, Co2, H2S, Ph

5.4 Population ecology

**B.SC.**

**Zoology Practical Syllabus**

**Semester-VI**

**Practical -3**

**Based on Paper-Z-603**

**Unit 1 Reproductive physiology**

1.1 To study permanent slide of mammalian ovum(T.S.) and oogenesis process by chart/multi media teaching method

1.2 To study permanent slide of mammalian sperm(T.S.) and spermatogenesis process by chart/multi media teaching method

1.3 To study T.S. mammary gland by chart/multi media teaching method

**Unit 2 Embryology**

2.1 A study of permanent slide of chick embryo

( 18, 24, 36, 48,& 72 hrs)

2.2 T.S. of chick embryo showing the development of neurulation (24, 33 hrs)

2.3 T.S. of chick embryo showing the development of heart (24, 33 hrs)

2.4 Mounting of chick embryo

Any 2 stage of embryonic development

2.5 Study of eggs and tadepoles of frog from collected/ preservative materials

**Unit 3 Evolution**

3.1 A study of animals of oriental region

Cat fish, Rhacophorous, Salamender, Lizard, Snake, Turtle, Wood pecker, Rabbit, Squirrel, and Hedge-hog

3.2 example of hardy Weinberg law

**Unit 4 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 characterisitcs of soil texture, colour and temperature

4.7 To study Water holding capacity of soil

## PRACTICAL INDEX

### Practical no 3 Based on PaperZ-603

1. To study permanent slide of mammalian ovum(T.S.) and oogenesis process
2. To study permanent slide of mammalian sperm(T.S.) and spermatogenesis process
3. To study T.S. mammary gland
4. A study of permanent slide of chick embryo
5. To study of T.S. of neurulation in chick embryo by permanent slide
6. To study of development of T.S. of heart in chick embryo by permanent slide
7. To study a chick embryo development by mounting (any one stage)
8. To study of egg and tadpole of amphibian (from collected/ preservative material)
9. To study animals of oreintal region
10. To study example of hardy Weinberg law
11. To study estimation of total hardness
12. To study estimation of O2 from tap water
13. To study estimation of O2 from polluted water
14. To study estimation of chlorinity and salinity in tap water
15. To study estimation of chlorinity and salinity in polluted water
16. To study physical characterisitcs of soil texture, colour and temperature
17. To study water holding capacity of the soil

## A list of references books of Paper-603

(1)Reprodctive 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 og Biololgy ---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)Practicak 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** | **14** | **07** |
| **Unit 2** | **Embryology** | **14** | **23** |
| **Unit 3** | **Evolution** | **14** | **15** |
| **Unit 4** | **Environmental pollution** | **14** | **10** |
| **Unit 5** | **Ecology** | **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) Idenitfy and describe**

**(2) Idenitfy and describe**

**(3) Idenitfy and describe**

**(4) Idenitfy and describe**

**Que:5 Any five photographic presentation of animals (Description with academic value) (05)**

**Que: 6 Viva voce (02)**

**Que:7 Certified Journal (02)**