

BHAKTA KAVI NARSINH MEHTA 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

FORWORD

Renewing and updating of the curriculum is the ingredient of any vibrant university academic system. Revising the curriculum should be a continuous 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, updating 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 world 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 designing of the curriculum we followed the UGC guideline for model curriculum. The exercise would not have been possible without the support of our respected faculties of zoology. We hope that the results will fulfil expectations of the society.

BHAKTA KAVI NARSINH MEHTA UNIVERSITY

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 into 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 quizzes should be attended by the students. 10 marks for assignments and 10 marks for quiz will be added to the final results of the semester. Total 30 marks are internally assessed and 70 marks for external (University Exams) exams, per paper. A student's performance in every practical session is assessed and marks for a maximum of 15 is given. External practical evaluation will carry 35 marks, so total 50 marks for each practical per paper examination will be counted. The pattern of semester exam will be as follows.

Sr. No.	Name Of Programme	B.Sc. ZOOLOGY		
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)**

BHAKTA KAVI NARSINH MEHTA UNIVERSITY

**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)**

**SKELETON OF THEORY EXAMINATION
(SEMESTER – I to VI)**

Paper Style for All Semester

1. The syllabus consists of five Units.
2. All Units carry equal marks.
3. There should be five questions in a question paper.
4. One question is to be asked from each Unit.
5. Each question carries 14 marks.
6. Time duration of 70 marks question paper is 2:30 hours.
7. Each question should be divided into a, b and c as shown below.
 - a. Answer the following. (Any one out of Two)----- (07 marks)
(Theory Question)
 - b. Attempt any one. (Out of Two)----- (04 Marks)
(Application/Example/Problem/Theory)
 - c. Attempt any three. (Out of Five) ----- (03 Marks)
(short answer/one word/one line/true or false/fill up the blanks)

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 (Platyhelminthes to Arthropoda)

4.1 Platyhelminthes: Parasitic adaptation with reference to Fasciola

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

4.3 Annelida: Metamerism and its significance

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

Unit-5 Invertebrate Part III (Mollusca to Hemichordata)

5.1 Mollusca: Foot in Mollusca, Torsion and Detorsion.

5.2 Echinodermata: Larval forms, water vascular system

5.3 Hemichordata: Affinities(Balanoglossus), Tornaria larvae

B.SC.
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, Ancylostoma, oxyuris

Annelida: Chaetopterus, Tubifex, Bonelia, Acanthobdella.

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

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

Echinodermata: Anthenea, Luidia, Echinocardium

Hemichordata: Balanoglossus

Unit 2: Dissection and Temporary mountings.

Scorpion

[1] External features [2] Digestive system

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

Sepia:

[1] External features [2] Digestive system

[3] Nervous System [4] Reproductive System

Mounting:

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

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

Unit 3: Preparation from preservative material

Protozoa: Balantidium, Opalina, Vorticella.

Porifera: Sponge, Spicules.

Coelenterata : Hydra with bud, Obelia medusa.

Platyhelminthes: Tape worm ova.

Nemathelminthes: Ascaris ova

Mollusca: Glochidium larvae.

Hemichordata: Tornaria larvae.

Unit 4 A study of permanent slides and important specimens.

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

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

(b) Life cycle of butterfly (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 Balanoglossus 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 pecten, 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)

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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 meiosis cell-division from bud of Tradescantia
12. Temporary preparation of Barr body
13. To study of giant chromosome from mounting of salivary gland of chironomid larva/Drosophila
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-green colour blindness)
17. To study transmission 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)

**SKELETON OF THEORY EXAMINATION
(SEMESTER – I to VI)**

Paper Style for All Semester

1. The syllabus consists of five Units.
2. All Units carry equal marks.
3. There should be five questions in a question paper.
4. One question is to be asked from each Unit.
5. Each question carries 14 marks.
6. Time duration of 70 marks question paper is 2:30 hours.
7. Each question should be divided into a, b and c as shown below.
 - a. Answer the following. (Any one out of Two)----- (07 marks)
(Theory Question)
 - b. Attempt any one. (Out of Two)----- (04 Marks)
(Application/Example/Problem/Theory)
 - c. Attempt any three. (Out of Five) ----- (03 Marks)
(short answer/one word/one line/true or false/fill up the blanks)

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, Natrrix, 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. Classification of protochordata to Amphibia
2. Classification of reptiles to mammals
3. To study digestive system, arterial , venous, brain, reproductive system of Pigeon
4. To study digestive system, arterial , venous, brain, reproductive system of rat
5. To study mountings of rat (Striated muscle and blood and 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

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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 preparation 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)

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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) Toluidine blue

(d) Methyl blue

(e) Acetocarmine

2.4 Histological structure

(a) Adrenal gland

(b) Ovary

(c) Testis

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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 preparation
 - 6.7 Sectioning
 - 6.8 Staining and mounting
 - 6.9 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

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

Time : 3 Hrs

Total- 35 Marks

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

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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
- 2.2 Fertilization and Embryonic development of chick upto 72 hrs
- 2.3 Cleavage, blastula, gastrula and upto 72 hrs
- 2.4 Placenta and placentation
- 2.5 Regeneration

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