

GUJARAT UNIVERSITY
3rd Semester B.Sc.
ZOOLOGY

(Effective from June 2018)

The syllabus is to be completed by assigning FOUR hours for each Theory Paper and a total of SIX hours for the Practicals, per week.

Pattern of Examination :

Theory (Ext. 140 marks & Int. 60 marks)

Practicals (Ext. 70 marks & Int. 30 marks)

Examination	Duration	External Marks	Internal Marks	Total Marks
Theory-Paper 201 (Animal diversity (nonchordates), Parasitology, Genetics & Animal biotechnology)	3 hours	70	30	100
Theory-Paper 202 (Animal diversity (chordates), Human Histology, Mammalian physiology and Endocrinology)	3 hours	70	30	100
Theory (Total)		140	60	200
Practical-Paper 203 (A) (Based on Theory Paper – 201)	3 hours	35	15	50
Practical-Paper 203 (B) (Based on Theory Paper – 202)	3 hours	35	15	50
Practicals (Total)		70	30	100

INSTRUCTIONS

1. Each theory paper comprises of FIVE UNITS. Each UNIT carries equal marks, i.e. 14 marks (14 x 5 = 70) in the university examinations.
2. The theory question papers will have to be set according to the paper-style and the pattern of marks-distribution provided on page no. 4 & 7 of this syllabus.
3. The paper-style & distribution of marks for the Practicals is also provided on page no. 9 & 12 of this syllabus.
4. In order to be qualified to appear in the University Practical Examination, the student must submit his/her duly certified journals during the examination.

ZOOLOGY SYLLABUS

SEMESTER – 3

PAPER – 201 (Theory)

(ANIMAL DIVERSITY (nonchordates), PARASITOLOGY, GENETICS & ANIMAL BIOTECHNOLOGY)

Unit I ANIMAL DIVERSITY (Nonchordates) – Systematics :

Salient features and Classification of Invertebrates, starting from Kingdom upto Classes, giving reasons & suitable examples (as per practical syllabus) :

Phylum :

- | | |
|-----------------|--------------------|
| 1. Protozoa | 4. Platyhelminthes |
| 2. Porifera | 5. Nematelminthes |
| 3. Coelenterata | 6. Annelida |

(Classification, as per adapted in the book – TEXTBOOK OF INVERTEBRATES by R.L.Kotpal, Rastogi Publication, Meerut).

Unit II ANIMAL DIVERSITY (Nonchordates) – Type study & General Topics :

General structure & morphology with functional anatomy of the following animal :

A Annelida : Type – **Earthworm** (*Pheritima posthuma*) - Classification, Habits & Habitat, Ext. characters, Body wall, Digestive system, Circulatory system, Excretory system, Nervous system, and Reproductive systems & reproduction

B General topics :

1. Coelenterata : Coral reefs (Introduction, Formation, Types, Importance)
2. Types of Symmetry (Radial, Biradial, Bilateral, Spherical)
3. Types and significance of Coelom.
4. Types and significance of Metamerism.

Reference Books for Units I & II :

1. **Textbook of Invertebrates**, R. L. Kotpal, Rastogi Publishers, Meerut.
2. **A Manual of Zoology**, E. K. Ayyer, Vol. I & II.
3. **Invertebrate Zoology**, Jordan and Verma, S. Chand & Company, Delhi.
4. **Invertebrate : Structure and Function**, E. J. W. Barrington.

Unit III PARASITOLOGY :

1. General Introduction: Parasite, Host, Host-parasite Relationships
2. Types of Parasites: Endoparasites (Obligate, Facultative), Exoparasite
3. Types of Hosts: Definitive, Intermediate, Reservoir
4. Morphology, Life cycle, Pathogenesis, Laboratory Diagnosis and Prophylaxis of the following human parasites:
Protozoan Parasites: *Entamoeba histolytica*, *Leishmania donovani*
Helminthes Parasites: *Taenia solium*, *Wuchereria bancrofti*

Reference Books for Unit III :

1. **Medical Parasitology**, CK Jayram Paniker, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi
2. **Protozoa**, R. L. Kotpal, Rastogi Publications, Meerut.
3. **Helminthes**, R. L. Kotpal, Rastogi Publications, Meerut.
4. **An Introduction to Parasitology**, P. N. Sharma, L. S. Ratnu, S. Chand & Co. Ltd., New Delhi

Unit IV GENETICS & ANIMAL BIOTECHNOLOGY :

Genetics :

1. Pleiotropism
2. Duplicate genes (15:1 ratio, e.g. Fruit shape in Shepherel's purse)
3. Multiple genes (e.g. Biochem. pathway of Tryptophan in *E. coli*)
4. Mutations :
 - Definition
 - Mutable & Mutator genes
 - Reverse mutation
 - Paramutations
 - Frame-shift mutations and their types
 - Mutagens (Radiation & Chemical agents)

Biotechnology :

Equipments for animal cell culture laboratory, in brief :

1. Water bath.
2. Magnetic stirrer
3. Variable volume micropipettes
4. Cryostorage containers
5. Inverted microscope.

Reference Books for Unit IV :

1. **Textbook of Genetics**, Veerbala Rastogi, Kedar Nath Ram Nath, Meerut.
2. **Genetics**, P.S.Verma & V.K.Agarwal, S. Chand & Company, Delhi.
3. **Fundamentals of Biotechnology**, P.K.Gupta, S. Chand & Company, Delhi.
4. **Culture of Animal Cells-A Manual of Basic Technique**, R. Ian Freshney, 5th Ed., A. John Wiley & Sons Inc. Pub.

Theory Paper-style and pattern of marks-distribution

PAPER – 201

(ANIMAL DIVERSITY (nonchordates), PARASITOLOGY, GENETICS & ANIMAL BIOTECHNOLOGY)

<u>Q. No.</u>	<u>UNIT NO.</u>	<u>MARKS</u>
Q.1.A	Unit-I 1,2,3 OR	07
Q.1.B	Unit-I 1,2,3 Unit-I 4,5,6 OR Unit-I 4,5,6	07
Q.2.A	Unit-II : A OR	07
Q.2.B	Unit-II : A Unit-II : B OR Unit-II : B	07
Q.3.A	Unit-III OR	07
Q.3.B	Unit-III OR Unit-III	07
Q.4.A	Unit-IV OR	07
Q.4.B	Unit-IV OR Unit-IV	07
Q.5	14 objective questions of 1 mark each. 3 questions from each of the four Units and remaining 2 questions from any of the four Units.	14

PAPER – 202 (Theory)
(ANIMAL DIVERSITY (chordates), HUMAN HISTOLOGY, MAMMALIAN
PHYSIOLOGY AND ENDOCRINOLOGY)

Unit I ANIMAL DIVERSITY (Chordates) – Systematics :

Salient features & Classification, starting from Kingdom upto Orders, with reasons & suitable examples (as per practical syllabus) of Protochordata, Cyclostomata, Pisces & Amphibia.

(Classification as per adapted in the book – TEXTBOOK OF VERTEBRATES by R. L. Kotpal, Rastogi Publication, Meerut).

Unit II ANIMAL DIVERSITY (Chordates) – Type Study & General Topics :

A. General structure & morphology with functional anatomy of the following animal :

Chondrichthyes : Type – **Shark** – (*Scoliodon sorrakowah*) : Ext. characters, Digestive system, Heart, Arterial system, Venous system, Respiratory system, Urinogenital systems, Nervous system (Brain & Cranial nerves), Sense organs (Membranous labyrinth & Ampulla of Lorenzini).

B. **General topics :**

1. Comparison of chordates with non-chordates.
2. Affinities of Cephalochordata.
3. Neoteny (Types and affecting factors)
4. Identification of venomous and non-venomous snakes of India
 - Venomous : Russel's viper, Krait, Cobra, King cobra, Marine snake.
 - Non-venomous : Boa, Pythons, Rat snake.
5. Poison apparatus and biting mechanism of Snake

Reference Books for Units I & II :

1. **Textbook of Vertebrates**, R. L. Kotpal, Rastogi Publication, Meerut.
2. **Chordate Zoology**, P. S. Dhama, and J. K. Dhama, S. Chand & Co., Delhi.
3. **Introduction to Chordates**, T. C. Majupuria, Pradeep Publication, Jalandhar.

Unit III PHYSIOLOGY AND HISTOLOGY

Physiology of Body Fluids:

- 1) Introduction, Significance, Compartments, Compositions
- 2) Dehydration, Water Intoxication (Overhydration)
- 3) Composition of Cerebrospinal fluid (CSF)
- 4) Composition of Milk

Human Histology

Histology of Tongue, Stomach, Small intestine, Liver, Pancreas, Lung, Bone and Cartilage

Unit IV MAMMALIAN PHYSIOLOGY AND ENDOCRINOLOGY

- A Digestion and Absorption of following dietary components in mammals:
Carbohydrates, Proteins, Lipids, Nucleic acids
- B Mammalian Endocrinology: Brief Structure, Hormones, Functions & Disorders
of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal, Ovary and Testis

Reference Books for Unit III & IV :

- 1. Principles of Anatomy and Physiology**, Tortora and Grabowski, Harper Collins College Publications.
 - 2. Essentials of Medical Physiology**, K.Sembulingam and Prema Sembulingam, Jaypee publications.
 - 3. Animal Physiology and Related Biochemistry**, H. R. Singh, Shobhan Lal Nagin Chand & Co., Educational Publishers, Jalandhar.
 - 4. Textbook of Biochemistry**, DM Vasudevan and Sreekumari S, Jaypee Publications.
 - 5. A Textbook of Animal Histology**, A. K. Berry, Emkay Publications, Delhi.
 - 6. Bailey's Textbook of Histology**, The Williams & Wilkins Company, Baltimore.
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Theory Paper-style and pattern of marks-distribution

PAPER – 202

**(ANIMAL DIVERSITY (chordates), HUMAN HISTOLOGY, MAMMALIAN
PHYSIOLOGY AND ENDOCRINOLOGY)**

<u>Q. No.</u>	<u>UNIT NO.</u>	<u>MARKS</u>
Q.1.A	Unit-I OR	07
Q.1.B	Unit-I Unit-I OR Unit-I	07
Q.2.A	Unit-II : A OR	07
Q.2.B	Unit-II : A Unit-II : B OR Unit-II : B	07
Q.3.A	Unit-III OR	07
Q.3.B	Unit-III Unit-III OR Unit-III	07
Q.4.A	Unit-IV : A OR	07
Q.4.B	Unit-IV : A Unit-IV : B OR Unit-IV : B	07
Q.5	14 objective questions of 1 mark each. 3 questions from each of the four Units and remaining 2 questions from any of the four Units.	14

PAPER – 203 (A) (Practicals)
(Based on Theory Paper 201)

1. ANIMAL DIVERSITY (Nonchordates) – Systematics :

Identification & classification of invertebrates (Kingdom to Class) :

1. Protozoa : Amoeba, Paramoecium, Polystomella, Euglena, Vorticella.
2. Porifera : Leucosolenia, Euspongia, Grantia.
3. Coelenterata : Hydra, Sea anemone, Physalia, Aurelia, Coral.
4. Platyhelminthes : Planaria, Liverfluke, Tapeworm.
5. Nematelminthes : Enterobius, Ascaris, Rhabditid.
6. Annelida : Nereis, Leech, Aphrodite, Amphitrite.

(Alongwith classification, a short description and habitat should also be written for each animal)

2. ANIMAL DIVERSITY (Nonchordates) :

A) Study of Earthworm :

1. Study of external characters.
2. Study of Digestive Circulatory System, Nervous system and Reproductive System.

B) Permanant slides / charts of :

1. Setae, Blood gland, Septal Nephridia, Ovary, Spermatheca
2. T.S. passing through pharynx, T.S. passing through gizzard, T.S. passing through typhlosole.

3. ANIMAL DIVERSITY (Nonchordates) :

A) Temporary mounting of some aquatic invertebrates like Euglena, Paramoecium, Hydra, Daphnia & Cyclops from the water sample.

B) Study through charts/models/slides :

1. Coelenterata : Kinds of coral reefs (Fringing, Barrier, Atoll)
2. Types of symmetry (As per theory syllabus)

4. PARASITOLOGY

Study of *Entamoeba histolytica*, *Leishmania donovani*, *Taenia solium*, *Wuchereria bancrofti* and their life stages through permanent slides / specimens / photographs.

5. GENETICS :

Study of genetics through charts :

1. Pleotropism
2. Duplicate genes (15:1 ratio, e.g. Fruit shape in Shepherel's purse)
3. Multiple genes (e.g. Biochem. pathway of Tryptophan in *E. coli*)
4. Mutations : Reverse mutation, Paramutations, Frame-shift mutations and their types

6. ANIMAL BIOTECHNOLOGY :

Study of animal biotechnology through charts/specimens :

1. Water bath
2. Magnetic stirrer
3. Variable volume micropipettes
4. Cryostorage containers
5. Inverted microscope.

GUJARAT UNIVERSITY
Semester-3 Zoology

(SKELETON QUESTION PAPER FOR PRACTICAL EXAMINATION)

PAPER-203 (A)
(*Based on Theory Paper 201*)

Date :	Marks : 35	Time :.....
Q.1	Sketch, lable and describe _____ system of Earthwarm.	06
Q.2	Identify the given figure of parasite and describe its pathogenicity	05
Q.3	Prepare temporary mounting of an aquatic invertebrate from given sample	04
Q.4	Identify specimens 1 to 6 as per instructions : Sp. 1 Identify and classify upto Class, giving reasons. Sp. 2 Identify and classify upto Class, giving reasons. Sp. 3 Identify and describe. Sp. 4 Identify and describe. Sp. 5 Identify and comment. Sp. 6 Identify and state its uses.	12
Q.5	Viva voce	04
Q.6	Journal.	04

DETAILS FOR PRACTICAL EXAMINATION (Question wise)
Semester-3 Zoology

PAPER-203 (A)
(*Based on Theory Paper 201*)

- Q.1 Earthworm : Digestive system, Circulatory, Nervous system, Reproductive System.
- Q.2 Parasitology : *Entamoeba histolytica*, *Leishmania donovani*
Taenia solium, *Wuchereria bancrofti* and their life stages
- Q.3 Temporary mounting of some aquatic invertebrates like Euglena, Paramoecium, Hydra, Daphnia & Cyclops from the water sample.
- Q.4 Sp.1 Protozoa, Porifera, Coelenterata
Sp.2 Platyhelminthes, Nematelminthes, Annelida
Sp.3 Charts/ Permanent slides of Earthworm : Setae, Blood gland, Septal nephridia, Ovary, Spermatheca, T.S. passing through pharynx, T.S. passing through gizzard, T.S. passing through typhlosole.
Sp.4 Kinds of coral reefs, Types of symmetry
Sp.5 Study of genetics through charts : 1, 2, 3 and 4.
Sp.6 Animal Biotechnology : Water bath, Magnetic stirrer, Variable volume micropipettes,, Cryostorage containers and Inverted microscope.
- Q.5 Syllabus of Theory Paper 201 and Practical Paper-203 (A) only.
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PAPER – 203 (B) (Practicals)
(*Based on Theory Paper 202*)

1. ANIMAL DIVERSITY (Chordates) – Systematics :

Identification & Classification of following animals upto Orders, giving reasons :

1. Protochordata : Amphioxus, Salpa, Doliolum, Ascidian.
2. Cyclostomata : Lamprey, Hagfish.
3. Pisces : Rohu, Catla, Sting rayfish, Electric rayfish, Sea horse, Suckerfish, Eel.
4. Amphibia : Ichthyophis, Salamander, Hyla.

(Alongwith classification, a short description and habitat should also be written for each animal)

2. IDENTIFICATION OF SNAKES :

Study by specimens (*only external characters*) :

- Venomous : Russel's viper, Krait, Cobra, King cobra, Marine snake.
- Non-venomous : Boa, Python, Rat snake.

3. ANIMAL DIVERSITY (Chordates) :

Study of Shark :

1. Study of external characters.
2. Study of Digestive system, Arterial system, Urinogenital systems, Brain.
3. Study of placoid scales, striated muscle fibres, Membranous Labyrinth, Ampulla of Lorenzini

4. HUMAN HISTOLOGY :

Identification & histological study of the following organs by permanant slides of :
T.S. of Tongue, Liver, Pancreas, Stomach, Small intestine, Bone, Cartilage, Lung

5. MAMMALIAN ENDOCRINOLOGY :

Permanant slides of : T.S. of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal, Ovary, Testis

6. PHYSIOLOGY OF DIGESTION :

Action of human salivary Amylase (ptyalin) on Starch.

GUJARAT UNIVERSITY
Semester-3 Zoology

(SKELETON QUESTION PAPER FOR PRACTICAL EXAMINATION)

PAPER-203 (B)
(*Based on Theory Paper 202*)

Date :

Marks : 35

Time :

- | | | |
|------------|--|-----------|
| Q.1 | Sketch, lable and describe _____ system of Shark. | 07 |
| Q.2 | Identify and complete the nomenclature of given figure with brief description. | 06 |
| Q.3 | Demonstrate the action of your own salivary amylase on the given Starch solution. | 04 |
| Q.4 | Identify specimens 1 to 5 as per instructions:
Sp. 1 Identify and classify upto Class, giving reasons.
Sp. 2 Identify and classify upto Class, giving reasons.
Sp. 3 Identify and comment.
Sp. 4 Identify and describe.
Sp. 5 Identify and describe | 10 |
| Q.5 | Viva voce. | 04 |
| Q.6 | Journal. | 04 |
-
-

DETAILS FOR PRACTICAL EXAMINATION (Question wise)
Semester-3 Zoology

PAPER-203 (B)
(*Based on Theory Paper 202*)

- Q.1** Shark : Digestive system, Arterial system, Urinogenital systems, Brain.
- Q.2** Histology (T.S. of Tongue, Liver, Pancreas, Stomach, Small intestine, Bone, Cartilage, Lung)
- Q.3** Action of Salivary amylase on Starch
- Q.4** Sp.1 Protochordata and Cyclostomata.
Sp.2 Pisces and Amphibia.
Sp.3 Venomous and Non-venomous snakes
Sp.4 Shark : Placoid Scales, Skeletal Muscle Fibre, Membranous Labyrinth,
Ampulla of Lorenzini
Sp.5 T.S. of Endocrine glands
- Q.5** Syllabus of Theory Paper-202 and Practical Paper-203 (B) only.

Note : *All examiners should take the viva sitting together and each examiner should give marks from 04 and then the average marks of all the examiners should be given to the candidate.*

NOTE :

- 1 The list of the reference books provided herein the syllabus is not an exhaustive list. Professors and students may use any other suitable reference books or media.*
- 2 Professors are strongly encouraged to make use of additional methods of teaching, besides chalk & duster, to complete the syllabus.*
- 3 It is strongly advisable to take students for an excursion tour or educational visit to any costal area, NP or sanctuary, in order to study the biodiversity in its natural habitat. However, collection of any fauna from its habitat should be avoided so as to help in maintaining the ecosystem.*
- 4 Prof.-in-charge of such tours should not compel the students to collect specimens for any type of submission work.*

GUJARAT UNIVERSITY

4th Semester B.Sc.

ZOOLOGY

(effective from June 2018)

The syllabus is to be completed by assigning FOUR hours for each Theory Paper and a total of SIX hours for the Practicals, per week.

Pattern of Examination :

Theory (Ext. 140 marks & Int. 60 marks)

Practicals (Ext. 70 marks & Int. 30 marks)

Examination	Duration	External Marks	Internal Marks	Total Marks
Theory-Paper 204 (Animal diversity (nonchordates & chordates), Insect Vectors and Diseases)	3 hours	70	30	100
Theory-Paper 205 (Animal diversity (chordates), Fishery biology, Wildlife of India, Pollution)	3 hours	70	30	100
Theory (Total)		140	60	200
Practical-Paper 206 (A) (Based on Theory Paper – 204)	3 hours	35	15	50
Practical-Paper 206 (B) (Based on Theory Paper – 205)	3 hours	35	15	50
Practicals (Total)		70	30	100

INSTRUCTIONS

1. Each theory paper comprises of FIVE UNITS. Each UNIT carries equal marks, i.e. 14 marks (14 x 5 = 70) in the university examinations.
2. The question papers will have to be set according to the paper-style and the pattern of marks-distribution provided on page no. 17 & 20 of this syllabus.
3. The paper-style & distribution of marks for each Practical is also provided on page no. 22 & 25 of this syllabus.
4. In order to be qualified to appear in the University Practical Examination, the student must submit his/her duly certified journals during the examination.

ZOOLOGY SYLLABUS

SEMESTER – 4

PAPER – 204 (Theory)

(ANIMAL DIVERSITY (nonchordates & chordates), INSECT VECTORS & DISEASES)

Unit I ANIMAL DIVERSITY (NonChordates) – *Systematics* :

Salient features and Classification of Invertebrates, starting from Kingdom upto Classes, giving suitable examples (as per practical syllabus) :

Phylum :

1. Arthropoda
2. Mollusca
3. Echinodermata
4. Hemichordata

(Classification, as per adapted in the book – TEXTBOOK OF INVERTEBRATES by R.L.Kotpal, Rastogi Publication, Meerut).

Unit II ANIMAL DIVERSITY (Nonchordates) – *Type Study & General Topics* :

General structure & morphology with functional anatomy of the following animal :

Arthropoda : Type – **Cockroach** (*Periplaneta americana*) – Classification, Habits & Habitat, Ext. characters, Digestive system, Circulatory system, Excretory system, Reproductive systems, Nervous system, and Sense organ (only compound eyes).

General topics :

1. Metamorphosis (Incomplete & Complete), Hormonal Control
2. Mouth parts of : Honey bee, Housefly, Butterfly, Mosquito (*Anopheles* & *Culex*-male & female) and Cockroach.

Reference Books for Units I & II :

1. **Textbook of Invertebrates**, R. L. Kotpal, Rastogi Publishers, Meerut.
2. **Manual of Zoology**, E. K. Ayyer, Vol. I & II.
3. **Invertebrate Zoology**, Jordan and Verma, S. Chand & Company, Delhi.

Unit III INSECTS VECTORS AND VECTOR-BORNE DISEASES

Introduction of Vectors (Mechanical & Biological)

Mosquitoes, Flies, Fleas, Ticks, Bugs, Lice, Mites, Cyclops, Cockroach as vectors

Study of Transmission, Symptoms, Control and Prophylactic measures of following diseases:

Mosquito-borne diseases- Malaria (*Anopheles*), Dengue (*Aedes*),

Chikungunia (*Aedes*), Filariasis (*Culex*)

Sand fly-borne diseases- Visceral Leishmaniasis, Flea-borne diseases- Plague

Tick-borne Encephalitis, Crimean-Congo haemorrhagic Fever (CCHF)

Bugs/Tsetse flies- Trypanosomiasis, Fleas-Riverblindness

Reference Books for Unit III :

Pedigo L. P. (2002) : **Entomology and Pest Management**. Prentice Hall Publication.

Methews, G. (2011) : **Integrated Vector Management : Controlling Vectors of Malaria and other Insect Vector borne Diseases**. Wiley-Blackwell

Unit IV ANIMAL DIVERSITY (Chordates) – General Topics :

Comp. anatomy of vertebrates – Brain, Aortic arches, Heart, Kidney

Reference Books for Unit IV :

1. **Textbook of Vertebrates**, R. L. Kotpal, Rastogi Publication, Meerut.
 2. **Chordate Zoology**, P. S. Dhami, and J. K. Dhami, S. Chand & Co., Delhi.
 3. **Introduction to Chordates**, T. C. Majupuria, Pradeep Publication, Jalandhar.
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Theory Paper-style and pattern of marks-distribution

PAPER – 204
(ANIMAL DIVERSITY (nonchordates & chordates), INSECT VECTORS AND VECTOR - BORNE DISEASES)

<u>Q. No.</u>	<u>UNIT NO.</u>	<u>MARKS</u>
Q.1.A	Unit-I OR Unit-I	07
Q.1.B	Unit-I OR Unit-I	07
Q.2.A	Unit-II OR Unit-II	07
Q.2.B	Unit-II OR Unit-II	07
Q.3.A	Unit-III OR Unit-III	07
Q.3.B	Unit-III OR Unit-III	07
Q.4.A	Unit-IV OR Unit-IV	07
Q.4.B	Unit-IV OR Unit-IV	07
Q.5	14 objective questions of 1 mark each. 3 questions from each of the four Units and remaining 2 questions from any of the four Units.	14

PAPER – 205 (Theory)

(ANIMAL DIVERSITY (chordates), FISHERY BIOLOGY, WILDLIFE of India, AQUATIC RESOURCE & MANAGEMENT)

Unit I ANIMAL DIVERSITY (Chordates) – Systematics :

Salient features & Classification, starting from Kingdom upto Orders, with reasons & suitable examples (as per practical syllabus) of Reptilia, Aves & Mammalia.

(Classification as per adapted in the book – TEXTBOOK OF VERTEBRATES by R. L. Kotpal, Rastogi Publication, Meerut).

Reference Books for Unit I :

1. **Textbook of Vertebrates**, R. L. Kotpal, Rastogi Publication, Meerut.
2. **Chordate Zoology**, P. S. Dhama, and J. K. Dhama, S. Chand & Co., Delhi.
3. **Introduction to Chordates**, T. C. Majupuria, Pradeep Publication, Jalandhar.

Unit II FISHERY BIOLOGY :

- 1 Brief introduction and importance of studying Fishery Science. (*not to be asked in exam*)
- 2 Study of fishing gears and crafts:
 - Nets : Stringed Cast net, Gill net, Drag net, Trawl net.
 - Boats : Dugout canoe, Macchwa, Flat-bottomed boat, Trawler.
- 3 Scales of fishes; Types of fins
- 4 Identification & Classification of the following fishes upto Family (*as per Dey*) :
 - Catla, Rohu, Mrigal, Hilsa, Dara, Ghol, Bombay duck and Pomfret.
- 5 Home Aquarium : Primary knowledge, Construction, General maintenance and Popular aquarium fishes.

Reference books for Unit II :

1. **Fish & Fisheries of India**, V. B. Jhingran, Hindustan Pub., Meerut.
2. **Fishery Science and Indian Fisheries**, Srivastav, Kitab Mahal Pub., Delhi.
3. **Fishes**, Chandy.

Unit III WILDLIFE of India :

1. Introduction : National Parks, Sanctuaries, Endangered, Vulnerable, Threatened Species.
2. Elementary knowledge of :
Marine National Park of Gujarat, Velavadar National Park, Gir National Park and Sanctuary, Wild ass Sanctuary of Gujarat and Nalsarovar Bird Sanctuary, Conservation projects of Tiger, Wild Ass, Black buck, Lion.
3. Wildlife management tools : Compass, Binoculars, Cameras, Radio-transmitters/receivers, Spotting Scope, Tranquilizer gun/darts.
4. Some endangered fauna of India (*give scientific name & brief note on each*) : Asiatic lion, Tiger, Leopard, Snow leopard, Black buck, Indian Bison, Indian wildass, Indian One-horned Rhino, Great Indian Bustard, Great Indian Hornbill, Peacock, Gangetic dolphin and Vultures.
5. Animal Evidences in the field: Pug marks, Hoof marks, Scats, Nests, Antlers.

Reference books for Unit III :

1. **Indian Wildlife, Srilanka, Nepal**, APA Publications.
2. **Wildlife of India**, Mark E. Trisch, HarperCollins Pub.
3. **Threatened Animals of India**, B.K. Tikader, ZSI, Calcutta.

Unit IV AQUATIC RESOURCE AND MANAGEMENT

Brief Introduction, Types of Resources, Water Resource, Sources of water, Scenario in India, Causes of Pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills, Sewage treatment, Water Quality Standards in India, Water quality assessment, Water Management-Sustainable water use in the 21st Century.

Reference books for Unit IV :

Environmental Biology and Toxicology, P D Sharma, Rastogi Publication, Meerut.

Theory Paper-style and pattern of marks-distribution

PAPER – 205

(ANIMAL DIVERSITY (chordates), FISHERY BIOLOGY, WILDLIFE of India, AQUATIC RESOURCES & MANAGEMENT)

<u>Q. No.</u>	<u>UNIT NO.</u>	<u>MARKS</u>
Q.1.A	Unit-I OR Unit-I	07
Q.1.B	Unit-I OR Unit-I	07
Q.2.A	Unit-II OR Unit-II	07
Q.2.B	Unit-II OR Unit-II	07
Q.3.A	Unit-III OR Unit-III.	07
Q.3.B	Unit-III OR Unit-III	07
Q.4.A	Unit-IV OR Unit-IV	07
Q.4.B	Unit-IV OR Unit-IV	07
Q.5	14 objective questions of 1 mark each. 3 questions from each of the four Units and remaining 2 questions from any of the four Units.	14

PAPER – 206 (A) (Practicals)
(Based on Theory Paper 204)

1. **ANIMAL DIVERSITY (NonChordates) – Systematics :**
Identification & classification of invertebrates (Kingdom to Class) :
 1. Arthropoda : Apus, Balanus, Prawn, Crab, Centipede, Butterfly, Scorpion.
 2. Mollusca : Chiton, Dentalium, Pila, Unio, Octopus.
 3. Echinodermata : Brittle star, Sea urchin, Sea cucumber, Feather star, Starfish.(Alongwith classification, a short description and habitat should also be written for each animal)

 2. **ANIMAL DIVERSITY (Nonchordates):**
 - A) Study of Cockroach by Charts / Video / Photographs :
 1. External characters.
 2. Study Digestive, Circulatory, Nervous systems, Reproductive system
 3. Study of V.S. of Compound eye, W.M. of Salivary gland, T.S. of Gizzard, W.M of Leg

 - B) Study of mouthparts of :
Honey bee, Housefly, Butter fly, Mosquito (*Anopheles* & *Culex*, male & female) and Cockroach.

 3. **INSECT VECTORS AND DISEASES :**
Study of Arthropod Vectors through permanent slides / photographs (As per theory syllbus)
Study of Vector Borne Diseases (As per theory syllbus)

 4. **ANIMAL DIVERSITY (Chordates) :**
Study through charts/specimens of :
Comp. anatomy of vertebrates – Brain, Aortic Arches, Heart, Kidney.
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GUJARAT UNIVERSITY

Semester-4 Zoology

(SKELETON QUESTION PAPER FOR PRACTICAL EXAMINATION)

PAPER-206 (A)

(*Based on Theory Paper 204*)

Date :

Marks : 35

Time :

- | | | |
|------------|--|-----------|
| Q.1 | Sketch, label and describe _____ system of Shark. | 06 |
| Q.2 | Identify the given figure of an arthropod vector and write brief description of its disease. | 05 |
| Q.3 | Identify & describe the mouth parts of given specimen. | 04 |
| Q.4 | Identify specimens 1 to 6 as per instructions :
Sp.1 Identify and classify upto Class, giving reasons.
Sp.2 Identify and classify upto Class, giving reasons.
Sp.3 Identify and classify upto Class, giving reasons.
Sp.4 Identify and describe.
Sp.5 Identify and comment.
Sp.6 Identify and comment. | 12 |
| Q.5 | Viva voce | 04 |
| Q.6 | Journal | 04 |
-
-

DETAILS FOR PRACTICAL EXAMINATION (Question wise)
Semester-4 Zoology

PAPER-206 (A)
(*Based on Theory Paper 204*)

- Q.1** Cockroach : Digestive, Circulatory, Nervous and Reproductive systems.
- Q.2** Vector and Vector-borne diseases (As per theory syllabus)
- Q.3** Honey bee, Housefly, Butterfly, Mosquito (*Anopheles* & *Culex*, male & female) and Cockroach.
- Q.4** Sp.1 Arthropoda
Sp.2 Mollusca
Sp.3 Echinodermata & Hemichordata
Sp.4 V.S. of Compound eye, W.M. of Salivary gland, T.S. of Gizzard,
W.M of Leg
Sp.5 Comp. anatomy of Aortic arches / Heart
Sp.6 Comp. anatomy of Brain / Kidney.
- Q.5** Syllabus of Theory Paper-204 & 205 and Practical Paper-206 (A) & (B) only.

Note : *All examiners should take the viva sitting together and each examiner should give marks from 04 and then the average marks of all the examiners should be given to the candidate.*

PAPER – 206 (B) (Practicals)
(Based on Theory Paper 205)

1. ANIMAL DIVERSITY (Chordates) – Systematics :

Identification & Classification of following animals with scientific names upto Orders, giving reasons :

1. Reptilia : Giant turtle, Tuatara, Common house lizard, Horned toad, Chameleon, Rat snake, Sea snake.
2. Aves : Stork, Pelican, Goose, Kite, Peacock, Crane, Cuckoo, Kingfisher, Woodpecker, Parakeet, Owl, Pigeon, Crow, Lapwing, Swift.
3. Mammalia : Hedgehog, Flying fox, Human, Dog, Blue whale, Donkey, Blue bull, Elephant, Dugong, Squirell, Indian hare, Pangolin.

(Alongwith classification, a short description and habitat should also be written for each animal)

2. FISHERY SCIENCE :

1. Study of fishing gears :

- Nets : Stringed Cast net, Gill net, Dole net, Drag net, Trawl net.
- Boats : Dugout canoe, Macchwa, Flat-bottomed boat, Trawler.

2. Identification & Classification of the following fishes upto Family (*as per Dey*) :

- Catla, Rohu, Mrigal, Hilsa, Dara, Ghol, Bombay duck and Pomfret.

3. Types of Fins

4. Scales of Fishes

3. WILDLIFE of India :

1. Study by photographs of some endangered fauna of India, alongwith scientific names (As per theory syllabus)

2. Field Observation Tools for Wildlife :

- Compass, Spotting Scope, Binoculars, Cameras, Radio-transmitters/receivers, Tranquilizer gun/darts.

3. Study of Animal Evidences in the field by photographs. (As per theory syllabus)

4. National Park & Sanctuary (*as per theory syllabus*) spotting in map of Gujarat.

5. Submit a field report of Herpato fauna, Avian fauna and Mammalian fauna of selected area.

6. AQUATIC RESOURCE & MANAGEMENT :

Titration of Total hardness, Calcium Hardness, Ca⁺⁺, Mg⁺⁺ using indicator tablet and BOD

NOTE :

- 1 *The list of the reference books provided herein the syllabus is not an exhaustive list. Professors and students may use any other suitable reference books or media.*
- 2 *Professors are strongly encouraged to make use of additional methods of teaching, besides chalk & duster, to complete the syllabus.*
- 3 *It is strongly advisable to take students for an excursion tour or educational visit to any Fishery centre, costal area, NP or Sanctuary, in order to study the biodiversity in its natural habitat. However, collection of any fauna from its habitat should be avoided so as to help in maintaining the ecosystem.*
- 4 *Prof.-in-charge of such tours should not compel the students to collect specimens for any type of submission work.*

GUJARAT UNIVERSITY
Semester-4 Zoology

(SKELETON QUESTION PAPER FOR PRACTICAL EXAMINATION)

PAPER-206 (B)
(*Based on Theory Paper 205*)

Date : Marks : 35 Time :

- Q.1** Identify and classify, giving reasons, the given two fishes. **07**
- Q.2** Titrate the given water sample , find out the_____and submit your **07**
result to the examiner
- Q.3** Identify specimens 1 to 8 as per instructions : **12**
Sp.1 Identify and classify upto Order, giving reasons.
Sp.2 Identify and classify upto Order, giving reasons.
Sp.3 Identify and classify upto Order, giving reasons.
Sp.4 Identify and describe.
Sp.5 Identify, state its scientific name and comment on the given specimen.
Sp.6 Identify and describe
- Q.4** Submission of Faunal study Report / Study Tour Report **05**
- Q.5** Journal. **04**
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DETAILS FOR PRACTICAL EXAMINATION (Question wise)
Semester-4 Zoology

PAPER-206 (B)
(*Based on Theory Paper 205*)

- Q.1** Catla, Rohu, Mrigal, Hilsa, Dara, Ghol, Bombay duck and Pomfret.
- Q.2** Titration: Total hardness, Calcium hardness, Ca^{++} , Mg^{++} , BOD
- Q.3**
- | | |
|------|---|
| Sp.1 | Reptilia |
| Sp.2 | Aves |
| Sp.3 | Mammalia |
| Sp.4 | Nets / Boats / Types of Scales / Types of Fins |
| Sp.5 | Asiatic lion, Tiger, Leopard, Snow leopard, Black buck, Indian Bison, Indian wildass, Indian One-horned Rhino, Great Indian Bustard, Great Indian Hornbill, Peacock, Gangetic dolphin and Vultures. |
| Sp.6 | Compass, Spotting Scope, Binoculars, Cameras, Radio-transmitters/receivers, Tranquilizer gun/darts, Pug marks, Hoof marks, Scats, Nests, Antlers. |
- Q.4** Submission of Faunal Study Report / Study Tour Report
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