GUJARAT UNIVERSITY
3rd Semester B.Sc.
ZOOLOGY

(effective from June 2012)

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), Cytology, Genetics & Animal biotechnology **)**	3 hours	70	30	100
Theory-Paper 202 **(** Animal diversity (chordates), Human Histology, Mammalian physiology **)**	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 & 6 of this syllabus.
3. The paper-style & distribution of marks for the Practicals is also provided on page no. 8 & 11 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), CYTOLOGY, GENETICS & ANIMAL BIOTECHNOLOGY)

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

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

Phylum :

1. Protozoa
2. Porifera
3. Coelenterata
4. Platyhelminthes
5. Nemathelminthes

(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*** **:**

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

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 **:** Kinds of coral reefs (Fringing, Barrier, Atoll)
2. Types of Symmetry.
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 ***CYTOLOGY*** **:**

1. Types and general functions of Lysosomes.
2. Cytoskeleton
3. Morphological characteristics of cancer cells.
4. Physiological characteristics of cancer cells.

Reference Books for **Unit III :**

1. **Cytology**, P. K. Gupta, S. Chand & Company, Delhi.
2. **Cell Biology**, C. B. Power, Himalaya Publishing House.
3. **Cellular and Molecular Biology**, De Robertis and De Robertis, Saunders Pub.

Unit IV ***GENETICS & ANIMAL BIOTECHNOLOGY*** **:**

(A) Genetics :

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 :
   - Definition
   - Mutable & Mutator genes
   - Reverse mutation
   - Paramutations
   - Frame-shift mutations and their types
   - Mutagens (Radiation & Chemical agents)

(B) 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), CYTOLOGY, GENETICS & ANIMAL BIOTECHNOLOGY)

Q. No.	UNIT NO.	MARKS
Q.1.A	Unit-I **:** 1 and 2	**07**
	OR	
	Unit-I **:** 1 and 2	
Q.1.B	Unit-I **:** 3, 4 and 5	**07**
	OR	
	Unit-I **:** 3, 4 and 5	
Q.2.A	Unit-II **:** A	**07**
	OR	
	Unit-II **:** A	
Q.2.B	Unit-II **:** B	**07**
	OR	
	Unit-II **:** B	
Q.3.A	Unit-III	**07**
	OR	
	Unit-III	
Q.3.B	Unit-III	**07**
	OR	
	Unit-III	
Q.4.A	Unit-IV **:** A	**07**
	OR	
	Unit-IV **:** A	
Q.4.B	Unit-IV **:** B	**07**
	OR	
	Unit-IV **:** B	
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)

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. Identification of venomous and non-venomous snakes of India **(*only external characters*) :**
   - Venomous **:** Russel's viper, Krait, Cobra, King cobra, Marine snake.
   - Non-venomous **:** Boa, Pythons, Rat snake.

Reference Books for **Units I & II :**

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.

Unit III ***HISTOLOGY OF HUMAN DIGESTIVE SYSTEM*** **:**

Histology of Tongue, Stomach, Small intestine, Liver and Pancreas

Unit IV ***PHYSIOLOGY OF DIGESTION & ABSORPTION OF FOOD*** **:**

Digestion and Absorption of following dietary components in mammals only **:**

- Carbohydrates
- Proteins
- Lipids
- Nucleic acids

Reference Books for **Units III & IV :**

1. **Principles of Anatomy and Physiology,** G. J. Tortora & S. R. Grabowski, HarperCollins College Publications.
2. **Animal Physiology and Related Biochemistry,** H. R. Singh, Shobhan Lal Nagin Chand & Co., Educational Publishers, Jalandhar.
3. **A Textbook of Animal Physiology**, A. K. Berry, Emkay Publications, Delhi.

Theory Paper-style and pattern of marks-distribution

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

Q. No.	UNIT NO.	MARKS
Q.1.A	Unit-I **OR** Unit-I	**07**
Q.1.B	Unit-I **OR** Unit-I	**07**
Q.2.A	Unit-II : A **OR** Unit-II : A	**07**
Q.2.B	Unit-II : B **OR** Unit-II : B	**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 – 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. Nemathelminthes **:** Enterobius, Ascaris, Rhabditid.

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

2. ***ANIMAL DIVERSITY* (Nonchordates) :**
   Study of Earthworm **:**
   A) Dissections & Temporary mountings **:**
      1. Study of external characters.
      2. Dissections for study of Digestive system and Nervous system.
      3. Temporary mountings of setae, septal nephridia and blood glands.

   B) Permanant slides of **:**
   T.S. passing through pharynx, T.S. passing through gizzard, T.S. passing through typhlosole.
3. ***ANIMAL DIVERSITY* (Nonchordates) :**
   Study through charts/models/slides **:**
   1. Coelenterata **:** Kinds of coral reefs (Fringing, Barrier, Atoll)
   2. Types of symmetry.
4. ***CYTOLOGY* :**
   Study through charts/models **:**
   1. Types of Lysosomes in a cell.
   2. Cytoskeleton - T.S. of a microtubule
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 Dissect the given Earthworm so as to expose the _____ system and show it to the examiner. **10**

Q.2 Make a temporary mounting of _____ from the Earthworm, stain if necessary and show it to the examiner. **03**

Q.3 Identify specimens 1 to 7 as per instructions **:** **14**

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, sketch and label.
Sp. 5 Identify and describe.
Sp. 6 Identify and comment.
Sp. 7 Identify and state its uses.

Q.4 Viva voce. **04**

Q.5 Journal. **04**

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

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

Q.1 Earthworm **:** Digestive system and Nervous system.

Q.2 Earthworm **:** Setae, septal nephridia and blood glands

Q.3 Sp.1 Protozoa and Porifera.
Sp.2 Coelenterata, Platyhelminthes and Nemathelminthes.
Sp.2 Permanant slides of Earthworm**:** T.S. passing through pharynx, T.S. passing through gizzard, T.S. passing through typhlosole.
Sp.4 Permanant slides of Earthworm **:** T.S. passing through pharynx, T.S. passing through gizzard, T.S. passing through typhlosole.
Sp.5 Kinds of coral reefs, Types of symmetry, Types of Lysosomes in a cell. and T.S. of a microtubule.
Sp.6 Study of genetics through charts **:** 1, 2, 3 and 4.
Sp.7 Animal Biotechnology : Water bath, Magnetic stirrer, Variable volume micropipettes,, Cryostorage containers and Inverted microscope.

Q.4 Syllabus of Theory Paper 201 and Practical Paper-203 (A) 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 – 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 **:** Icthyophis, Salamader, 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 **:**

Dissections & Temporary mountings **:**

1. Study of external characters.
2. Dissections for study of Digestive system, Arterial system, Urinogenital systems and Brain.
3. Temporary mountings of placoid scales and striated muscle fibres.

4. ***HISTOLOGY OF HUMAN DIGESTIVE SYSTEM*** **:**

Identification & histological study of the following organs by permanant slides of **:** T.S. of Tongue, Liver and Pancreas.

5. ***HISTOLOGY OF HUMAN DIGESTIVE SYSTEM*** **:**

Identification & histological study of the following organs by permanant slides of **:** T.S. of Stomach and Small intestine.

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 Dissect the given shark so as to expose the _____ system and show it to the examiner. **10**

Q.2 Make a temporary mounting of _____ from the shark, stain if necessary and show it to the examiner. **03**

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 **:** **10**

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, sketch and label.

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 and Urinogenital systems

Q.2 Shark **:** Placoid scales and striated muscle fibres.

Q.4 Sp.1 Protochordata and Cyclostomata.
Sp.2 Pisces and Amphibia.
Sp.3 Venomous and Non-venomous snakes
Sp.4 Permanant slides of T.S. of Tongue, Liver and Pancreas.
Sp.5 Permanant slides of T.S. of Stomach and Small intestine.

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.***