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**Accredited By NAAC**

**2009**

**Revised Syllabus For**

**Bachelor of Science**

**(Part - II ) ZOOLOGY**

(Subject to the modifications to be made from time to time)

**Syllabus to be implemented from June -2014 onwards.**

**Revised syllabus** – (As per U.G.C. guidelines) for B.Sc. II Semester III & IV  
Zoology to be submitted to the Shivaji University, Kolhapur (To be implemented  
from **June 2014**)

### **B.Sc. II Semester III & IV Zoology**

#### **Aims and Objectives-**

##### **A) Aims-**

- 1) To impart the knowledge of animal science to the pupils.
- 2) To make the pupil to use the knowledge in their daily life.
- 3) To make the pupil aware of natural resources and environment.
- 4) Application of knowledge in Zoology for nutrition, agriculture & livestock.
- 5) To provide practical experiences which form a part of their learning processes.
- 6) To develop aptitude for scientific work & ability to pursue studies far beyond graduation.
- 7) To encourage the pupil to take life science as a carrier which is the need now a days.
- 8) To make the pupils fit for the society.

##### **B) Objectives -**

- 1) To impart knowledge is the basic aim of education. The students are expected to acquire the knowledge of animal science, natural phenomenon, manipulation of nature & environment by man.
- 2) Understanding the scientific terms, concepts, facts, phenomenon & their interrelationships.
- 3) Applications of the knowledge.
- 4) To develop skills in practical work, experiments & laboratory materials, instruments.
- 5) To develop interests in the subject & scientific hobbies.

- 6) To develop scientific attitude which is the major objective. This makes the students open minded, critical observations, curiosity, thinking etc.
- 7) Abilities to apply scientific methods, collection of scientific data, problem solving, organize science exhibitions, clubs etc.
- 8) Appreciation of the subject, contributions of scientists, scientific methods, scientific programs etc.

**Duration** – The course shall be full time three years degree course

**Pattern** – For Theory semester & for practicals annual.

**Medium of Instruction** – English

### Structure of Course - B.Sc.-II Zoology

<b>Sem. III</b>			
Sr.No	Paper No.	Marks	
		Paper	
1	Paper V	50 marks	
2	Paper VI	50 marks	
<b>Sem. IV</b>			
3	Paper VII	50 marks	
4	Paper VIII	50 marks	
<b>Practical (Annual)</b>			
1	Practical 1	50	----
2	Practical 2	50	----
	<b>Grand Total</b>	<b>300</b>	

### Scheme of Teaching –

Sr.No.	Theory Paper	Lectures
1	Sem -III Paper V	3
2	Paper VI	3
3	Sem- IV Paper VII	3
4	Paper VIII	3

### Practical

Sr.No.	Practical Paper (Annual)	Lectures
1	Paper V	4
2	Paper VI	4
3	Paper VII	4
4	Paper VIII	4

(**Note** – 3 Lectures per paper per week for theory & 4 lectures per paper per week for practical)

## **SCHEME OF EXAMINATION**

Question paper will be set in the view of the / in accordance with the entire syllabus and preferably covering each unit of syllabi.

## **EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS (FOR REVISED SYLLABUS)**

Refer last page

## **OTHER FEATURES**

. Required Books, and Journals are stated in each syllabus of Part I, Part II and Part III of Zoology and Fisheries.

### **A) LIBRARY :**

Reference books, Text Books, Journals and Periodicals. Reference Books for Advanced Studies.

### **B) SPECIFIC EQUIPMENTS:** Necessary to run the Course (T.V., L.C.D., and

Overhead Projector), (Computer and necessary soft wares , operating systems, internet . etc.)

### **C) LABORATORY SAFETY**

- Fire Extinguishers at least two sets in each laboratory. (Lab. area 600 sq.ft.)
- Leakage of gases be avoided.
- Primary medical aid box (First Aid Kit)
- Sugar / Glucose – 500 gm pack: Pinch of sugar and a cup of drinking water in hypoglycemic condition. OR In extreme weakness of student or person concerned.
- Rules of animal ethics should be strictly followed.

## **D) LABORATORY INSTRUCTIONS**

- 1) Always wear an apron inside the laboratory. Do not wear it outside.
- 2) Do not drink or eat inside the laboratory.
- 3) Do not place pencil, fingers or any material in the mouth. Moisten labels with water.
- 4) Use microscopes and other instruments carefully.
- 5) Discard all used glassware such as test tube, pipettes, petry-plates, glass slides in a receptacle meant for it.
- 6) Put cotton plugs, papers, matches, waste dissection material etc. in a waste-paper basket. Do not throw them in sink not leave them on desk or floor.
- 7) Regard all cultures as pathogenic. Take every precaution against infection.
- 8) Report all accidents to the concerned teacher immediately.
- 9) Wash hands thoroughly with soap and water before and after dissection and experiment.
- 10) Always turn off water, gas and electricity before leaving the laboratory.
- 11) When students enter in lab. they should have – A Laboratory Journal, pencil and eraser, foot rule, dissection box with dissecting instruments, a small napkin.
- 12) All drawings must be made with drawing pencil only.
- 13) As the journal is to represent student's bonafide work during the whole year, student should keep it as clean as possible and do not loose it..
- 14) Students should not forget that unless their journals are certified, they are not allowed to appear for the university examination.

**B.Sc. II Zoology**  
**Semester III**  
**Paper V - Animal Diversity-III**

A) Lectures / Contact Hours per unit : 11

B) Contact hours per practical : 04

45

**UNIT I : Study of Nonchordates**

**A. Salient features and Classification up to classes of the following with Suitable examples:**

10

- i. Arthropoda
- ii. Mollusca
- iii. Echinodermata
- iv. Hemichordata

**B. Amazing invertebrates:**

- i. Bioluminescence in Firefly.
- ii. Parental care in mud wasp.
- iii. Courtship in Praying mantis.
- iv. Protective behavior in sepia

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**UNIT II : Study of phylum Arthropoda**

**A. Crab:**

- i Systematic position
- ii Habits and habitat
- iii. Morphology.
- iv. Nervous system.

**B. Cockroach:**

- i Systematic position
- ii Habits and habitat
- iii. Morphology.
- iv. Study of digestive system.
- v. Study of excretory system.
- vi. **Nervous system**
- vii. Study of reproductive system.
- viii. Cocoon formation
- ix. **Control measures**

### **UNIT III : Study of phylum Mollusca**

12

#### **Pila:**

- i Systematic position
- ii . Habits and habitat.
- iii. Morphology – Shell and pallial complex.
- iii. Study of digestive system.
- iv. Study of respiratory system.
- v. Study of nervous system,
- vi. Study of sense organs- osphradium and statocyst.
- vii. Study of reproductive system.

12

### **UNIT IV : Study of following general topics in Nonchordates**

#### **A. Mouthparts in insects:**

- i. Cockroach
- ii. Honey bee
- iii. Housefly
- iv. Mosquito- **Anopheles & Culex**
- v. Butterfly

#### **B. Foot in Mollusca**

#### **C. Pedicellariae in Echinodermata**

#### **D. Affinities in Hemichordata**

## **Paper – VI Genetics and Biological Chemistry**

45

### **UNIT I : Genetics Part I**

12

#### **A. Linkage and Crossing over**

- i. Incomplete and complete Linkages.
- ii. Mechanism of Crossing over.
- iii. Cytological evidence of Crossing over.
- iv. Significance of Linkage and Crossing over.

#### **B. Sex determination.**

- i. Sex Chromosomes.
- ii. Chromosomal Theory.
- iii. Genic Balance Theory.
- iv. Environmentally controlled sex determination (Bonelia)



**C. Gynandromorphs.**

- i. Types of gynanders.
- ii. Causes of formation of gynanders.
- iii. Examples with morphological characters.

**UNIT II : Genetics Part II**

**10**

**A. Interaction of genes.**

- i. Supplementary genes with suitable example
- ii. Complementary genes with suitable example
- iii) Inhibitory genes with suitable example

**B. Lethal Genes.**

- i. Fully lethal genes with suitable example
- ii. Semi lethal genes with suitable example.

**C. Twins in human**

**i. Types of Twins**

**ii. Origin of Twins**

**iii. Environmental influence on twins**

**UNIT III : Biological Chemistry Part I**

**10**

**A. pH and Buffers.**

- i. Water Properties, Dissociation and Significance.
- ii. pH definition , Henderson-Hasselblanch Equation.
- iii. Buffers in Biological Systems.

**B. Classification and Biological Significance of -**

- i. Carbohydrates
- ii. Proteins
- iii. Lipids.

**UNIT IV : Biological Chemistry Part II**

**13**

**A. Nucleic Acids.**

- i. DNA- Structure and Biological Significance.
- ii. RNA- Structure, Types and Biological Significance.

**B. Enzymes.**

- i. Classification (outline)
- ii. Characteristics of enzymes.
- iii. Mechanism of enzyme action with suitable example.
- iv. Factors controlling enzyme action.
- v. Isoenzymes, Co-factors and Co-enzymes.

**C. Significance of metal ions with reference to human body**

- i. Iron ii. Calcium iii. Sodium iv. Potassium v. Iodine

**List of Reference Books:**

1. The invertebrates: Hyman. L. H.
2. Arthropoda, Mollusca and Echinodermata: Kotpal.R.L.
3. Mollusca: Mortan.J.E.
4. Echinodermata: Nichols, D.
5. Students Text-Book of Zoology: Sedgwick. A (Vol.I to III).
6. Invertebrate Zoology; Barnes.
7. Biology of Higher Invertebrates: Russell-Hunter.
8. Invertebrate Zoology: Jordan, E.L. and Verma, P.S.
9. The Text-Book of Invertebrate Zoology. Agarwal, V.P. and Dakeka.R.C
10. Invertebrates: Kotpal.R.C.
11. Principles of Modern Zoology: Nigam. H.C.
12. A Textbook of Invertebrate Zoology. Prasad. S.N.
13. A Textbook of Invertebrate Zoology: Srivastava.M.
14. Cell and Molecular Biology. De robertis.
15. Genetics: M.W.Strickberger, New York.
16. Principles of genetics: Sinnott, Dunn and Dobzansky.
17. Principles of genetics: Edidon Gardner.
18. Molecular Biology of the Dell. Alberts, Bray/Raff/Roberts and Watson.
19. The Molecular biology of the Gene. J.D. Watson.
20. Cell Biology: C.B.Powar.
21. Outline of Biochemistry. Conn.E.E. and Stumpf. P. Y.
22. Biochemistry: Leninger. A. L.
23. Biochemistry: Das;
24. Biochemistry Vikl I Dasgupta.S.K.
25. Textbook of Biochemistry: Rao. K.R.
26. Textbook of Biochemistry: West. E.S., Todd, W.R., Mason.H.S. And Van Bruggen, J.T.
27. Review of Physiological Chemistry: Harper. H.A.
28. Molecular Biology: Gupta. P.K.
29. Genetics: Gupta. P.K.

# Zoology

## Semester IV

- A) Lectures / Contact Hours per unit : 11  
B) Contact hours per practical : 04

### Paper VII Animal Diversity - IV

<b>UNIT I: Study of Chordates</b>	<b>10</b>	45
<b>A. Salient features and classification of Reptiles, Birds and Mammals up to orders with suitable examples.</b>		
<b>B. Poisonous and non-poisonous snakes.</b>		
i. Identification characters.		
ii. Poison apparatus.		
iii. Venom, antivenom production , effects of venom.		
iv. Snake bite and first aid treatment.		
<b>UNIT II : Study of Rat (<i>Rattus rattus</i>) - Part I</b>	<b>10</b>	
i. Systematic position.		
ii. Habits and habitat.		
iii. Morphology.		
iv. Study of digestive system.		
v. Study of respiratory system.		
<b>UNIT III : Study of Rat(<i>Rattus rattus</i>) -Part II</b>	<b>13</b>	
i. Study of circulatory system.		
ii. Study of excretory system.		
ii. Study of central nervous system.		
iv. Study of sense organs - eye and ear.		
v. Study of reproductive system.		
<b>vi. Control measures.</b>		
<b>UNIT IV : Study of the following general topics</b>	<b>12</b>	
<b>i. Amazing Vertabrates</b>		
a) Desert adaptations in Phrynosoma.		
b) Flying adaptations in lizard (Draco)		
c) Nesting habits in Swift & swallow		
d) Aquatic mammals –Whale & Walrus		
ii. Aerial adaptations in birds.		
iii. Dentition in mammals.		
iv. Salient features and affinities of monotremes and marsupials.		

## Paper – VIII Histology and Physiology

	45
<b>UNIT I : Histology of mammalian organs Part I</b>	<b>11</b>
i. Tooth	
ii. Tongue	
iii. Salivary gland (parotid gland)	
iv. Stomach	
v. Duodenum	
vi. Ileum	
vii. Liver	
viii. Pancreas	
<b>UNIT II : Histology of mammalian organs Part II</b>	<b>11</b>
i. Kidney	
ii. Testis	
iii. Ovary	
iv. Uterus	
v. Pituitary	
<b>UNIT III : Physiology Part I</b>	<b>11</b>
i. Hormones of pituitary gland	
ii. Sex hormones	
iii. Oestrous cycle	
iv. Menstrual cycle	
v. Hormonal control of pregnancy, parturition and lactation	
vi. Hormonal control of testicular activities	
<b>UNIT IV : Physiology Part II</b>	<b>12</b>

### **A) Contraception.**

#### **Types of Contraceptives**

#### **B.. Invitro fertilization:**

- i. Technique
- ii. Significance

#### **C. Body defence:**

- i. Immune system: a) Humoral immunity and its mechanism.  
b) Cellular immunity and its mechanism.
- ii. Organs involved in immune system:
  - a) Bone marrow
  - b) Lymphatic Nodes.

**List of Reference Books:**

1. Rat : Rowett
  2. Rat : Kshirsagar
  3. Studies on the structure and Development of Vertebrates: Goodrich, E.S (Vol I & II)
  4. Introduction to Chordates : Manjupuria T.C
  5. A textbook of zoology : Parkar, T.J and Haswell, W.A
  6. A textbook of vertebrate Zoology : Prasad, S.N
  7. The life of vertebrates : Younge, J.Z
  8. Comparative Vertebrates Anatomy : Hayman, L.H
  9. The anatomy of Garden lizard (Calotes versicolor ); Paranjpe, S.Y ( Zoology monograph Pub. Uni. Of Poona).
  10. Zoology of Chordates: Nigam,H.C.
  11. The Text-Book of Vertebrate Zoology: Agarwal, IV, P and Dalela, R.C.
    - a. Chordates: Dhami and Dhami.
    - b. Rat : Dhami and Dhami.
  12. Vertebrates: Kotpal, R.C.
  13. Textbook of Histology: Bloom W and Fawcett D.W.
  14. Bailey's Textbook of Histology. Williams and Wilkins, Baltimore and Scientific Book Agency, Calcutta: Copenhaver, W.M.
  15. Histology: Lippincott. Ham, A.W.
  16. Histology: Greep, R.O and Well, L.
  17. An Atlas of Histology. Heinemann Educational Book Ltd. London And ELBS: Freeman. W.H. And Bracegirdle, B.
  18. Microscopic Anatomy of vertebrates, Lea and Febigen. Philadelphia: Kendall, J.I.
  19. Histology of Mammals: Athavale, M.V and Latey, A.N.
  20. Human Physiology: Chatterjee, C. C.
  21. Physiology: Guyton and Hall.
- Detailed Syllabus of Practicals for B.Sc.Part-II (Zoology) Semester – III & IV (Annual Pattern)

## **Practical-I (Based on Paper V & VI)**

### **Unit I**

#### **A. Classification and morphological peculiarities of the following up to classes.**

( Sketches/Photographs may be used )

i. **Arthropoda** - Apus, Balanus, Lobster, Grasshopper, Butterfly, Moth, Millipede, Centipede, Scorpion, Spider, Peripatus.

ii. **Mollusca** - Chiton, Dentalium, Patella, Aplysia, Snail, Slug, Mytilus, Pearl Oyster, Octopus.

iii **Echinodermata** - Sea-lily, Brittle-star, Starfish, Sea-urchin, Sea cucumber

iv. **Hemichordata** - Balanoglossus.

**B . Amazing invertebrates** - Fire fly, Mud wasp, Praying mantis, Sepia, **Spider**.

### **Unit II**

#### **A. Crab :**

i. Systematic position and external characters.

ii. Study of appendages.

iii. Dissection of nervous system. (Demonstration)

#### **B. Cockroach :**

i. Systematic position and external Characters.

ii. Sexual dimorphism

iii. Dissection of -

a) Digestive system

b) Nervous system

c) Male reproductive system

d) Female reproductive system

iii. Temporary preparation of –

**Trachea ,Striated muscles. Gizzard**, Mouth parts, Walking leg, Thoracic spiracles and Gonapophysis

### **Unit III**

#### **A. Pila:**

i. Systematic position and external Characters

ii. Dissection of –( Demonstration)

a) Digestive system.

b) Nervous system

iii. Temporary Preparation of --( Demonstration)  
Osphradium, Radula. and Statocyst.

**B. Study of Mouth Parts of Insects. -**  
Honeybee, Mosquito, Housefly, Butterfly

#### **Unit IV**

**A. Study of foot in Mollusca:**  
Chiton, Pila, Mytilus, Unio, Sepia.

**B. Demonstration of water current in Bivalve**

**B. Examples in Genetics** (at least 10 examples)  
Examples based on Crossing over, Linkage, Interaction of genes (**Complementary, Supplementary & Inhibitory**) & and Sex- determination.

**C. Biochemical Detection of food constituents**  
**Carbohydrates-** Starch Maltose, Lactose, Glucose, Fructose  
Proteins and Lipids.

**D. Demonstration of enzyme action:**  
i. Urea-Urease reaction.  
ii. Effect of temperature and pH on enzyme activity.  
iii. Action of protease (papaine) on proteins.  
**E. Study of enzyme action of salivary amylase.**

## **Practical-II ( Based on Paper VII & VIII)**

### **Unit I**

**A . Classification and Morphological Peculiarities of the following up to orders:**

( Sketches/Photographs may be used )

- i. **Reptilia** - Chameleon, Gecko, Cobra, Crocodile.
- ii. **Aves** - Duck, Kite, Woodpecker, Sparrow, Sunbird, Vulture, Kingfisher.
- iii. **Mammals**- Platypus, Bat, Scaly ant eater, Loris, Rabbit, Tiger, Whale

**B. Rat : (Demonstration Practical)**  
**Study of the following Systems:**

- i. Digestive System.

- ii. Respiratory System.
- iii. Arterial System.
- iv. Venous System.
- v. Excretory System.
- vi. Reproductive System.

## **Unit II**

### **A . Dissection of –**

- i. Brain of Rat/fowl

### **B.. Temporary Preparation of :**

- i. Blood of mammal.
- ii. Pecten of fowl.
- iii. Sclerotic Plate of fowl.
- iv. Collumella of fowl.
- v. Hyoid Apparatus of fowl.

## **Unit III**

### **A . Identification of the following Poisonous and Non-Poisonous snakes.**

Cobra, Pit viper, Russell's viper, Saw Scaled viper, Krait, Sea snake, Rat snake, Water snake.

### **B .Study of Amazing Vertebrates - Phrynosoma, Draco , Swift,Swallow, Whale,Walrus.**

### **C. Dentition in Mammals with reference to:**

Rabbit, Sheep, Rat, Dog, Man.

## **Unit IV**

### **A . Study of histology of following mammalian organs :**

- i. Tooth (V.S.) ii. Tongue iii. Salivary gland (Parotid) iv. Stomach v Duodenum.vi. Ileum vii. Liver viii. Pancreas ix. Kidney x. Testis xi. Ovary
- xii Pituitary gland xiii. Uterus.

### **B . Preparation of Haemin crystals.**

### **C. Detection of bleeding & clotting time.**

### **D . Study of abnormal constituents of urine.**

### **E . Study of Blood groups.**

### **F . Visit to Sea-shore/any suitable place to study animal diversity.**



# Nature of theory question paper

Common Nature of Question Paper as per Science Faculty.

## Distribution of Marks for Practical Examination: (Annual Pattern)

### Practical- I

1. Dissection-.....	13
2. Temporary Preparation/Mounting.....	07
3. Biochemical Tests/ Enzyme Action.....	07
4. Genetics Example.....	08
5. Identification.....	10
6. Journal.....	05
	<b>Total 50</b>

### Practical- II

1. Dissection-.....	13
2. Temporary Preparation/Mounting.....	07
3. Physiological Experiment.....	07
4. Submission of Excursion Report and Viva-voce based on it. ....	08
5. Identification.....	10
6. Journal.....	05
	<b>Total 50</b>

