



Rayat Shikshan Sanstha's
Sadguru Gadage Maharaj College, Karad.
(An Autonomous)

SYLLABUS

For

B.Sc. III Zoology

(Semester Pattern)

B.Sc. Sem.V to VI



Estd.1954

'A+'Accredited by NAAC (2017)

With CGPA 3.63

Under

Choice Based Credit System

(CBCS)

To be implemented

from

June, 2024-25 onwards

Rayat Shikshan Sanstha's
SADGURU GADAGE MAHARAJ COLLEGE, KARAD (Autonomous)
Department of Zoology
REVISED Syllabus for B.Sc. III (Zoology)

1. **TITLE:** Zoology

2. **YEAR OF IMPLEMENTATION:** Revised Syllabus will be implemented from June 2021 onwards.

3. **PREAMBLE:**

- a) This syllabus is framed to give sound knowledge with understanding of Zoology to undergraduate 6 students at third year of B.Sc. degree course.
- b) The goal of the syllabus is to make the study of Zoology popular, interesting and encouraging to the students for higher studies including research.
- c) The new syllabus is based on a basic and applied approach with vigour and depth. At the same time precaution is taken to make the syllabus comparable to the syllabi of other universities and the needs of industries and research.
- d) The syllabus is prepared after discussion at length with number of faculty members of the subject and experts from industries and research fields.
- e) The units of the syllabus are well defined, taking into consideration the level and capacity of students.

4. **GENERAL OBJECTIVES OF THE PROGRAM:**

- a) To nurture academicians with focus and commitment to their subject.
- b) To shape good and informed citizens from the students entering into the program.
- c) To create a skilled workforce to match the requirements of the society.
- d) To impart knowledge of science is the basic objective of education.
- e) To develop scientific attitude is the major objective to make the students open minded, critical, curious.
- f) To develop skill in practical work, experiments and laboratory materials and equipment's along with the collection and interpretation of scientific data to contribute the science.

5. **PROGRAM OUTCOMES:**

- a) The student will graduate with proficiency in the subject of his choice.
- b) The student will be eligible to continue higher studies in his subject.
- c) The student will be eligible to pursue higher studies abroad.

- d) The student will be eligible to appear for the examinations for jobs in government organizations.
- e) The student will be eligible to appear for jobs with minimum requirement of B. Sc. program.

6. PROGRAM SPECIFIC OBJECTIVES:

- a) The students are expected to understand the fundamentals, principles, concepts and recent developments in the Zoology.
- b) The practical course is framed in relevance with the theory courses to improve the understanding of the various concepts in Zoology.
- c) It is expected to inspire and boost interest of the students in Zoology.
- d) To develop the power of appreciations, the achievements in science and role in nature and society.
- e) To enhance student sense of enthusiasm for science and to involve them in an intellectually stimulating experience of Course in a supportive environment.

7. PROGRAM SPECIFIC OUTCOMES:

- a) Understand the basics of Zoology.
- b) Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.
- c) Develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Zoology.
- d) Identify their area of interest in academic, research and development.
- e) Perform job in various fields like science, environment, education, banking, business and public service, etc. or be an entrepreneur with precision, analytical mind, innovative thinking, and clarity of thought, expression, and systematic approach.

8. DURATION: The Course shall be a full-time course.

9. PATTERN: Pattern of Examination will be Semester.

10. MEDIUM OF INSTRUCTION: The medium of instruction shall be in English.

**Rayat Shikshan Sanstha's
SADGURU GADAGE MAHARAJ COLLEGE, KARAD (Autonomous)
Department of Zoology**

Syllabus for B.Sc. III (Zoology)

B.Sc III Zoology Semester V

Paper Code	Paper Title	Lecture per week	Credits	Practical Papers	Lecture per week	Credits
NBZT22-501	Comparative Anatomy of Vertebrates	3	2	NBZP22- 508: Zoology Practical-V (Practical based on NBZT22- 501 & NBZT22- 502) &	10	4
NBZT22-503	Biotechniques and Biostatistics	3	2	NBZP22- 509 +Project Practical VI (Practical based on NBZT22- 503 & NBZT22- 504)	10	4
NBZT22-504	Molecular Cell Biology and Animal Biotechnology	3	2			
AECC	English	3	4			
SEC	SEC V	3	2			
Elective Paper (Any One)						
NBZT22-502	Aquatic Biology	3	2			
NBZT22-505	Animal Behaviour	3	2			
NBZT22-506	Wildlife conservation and Management	3	2			

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Department of Zoology**

Syllabus for B.Sc. III (Zoology)

B.Sc. III Zoology Semester VI

Paper Code	Paper Title	Lecture per week	Credits	Practical Papers	Lecture per week	Credits
NBZT22-601	Developmental Biology of Vertebrates	3	2	NBZP22- 608: Zoology Practical-VII(Practical based on NBZT22- 601 & NBZT22- 602)	10	4
NBZT22-603	Immunology	3	2			
NBZT22-604	Applied Zoology - II	3	2	NBZP22- 609+ Project: Practical VIII(Practical based on Project+NBZT22-603 & NBZT22- 604)	10	4
AECC	English	3	4			
SEC	SEC VI	3	2			
Elective Paper (Any One)						
NBZT22-602	Insect Vectors and Histology	3	2			
NBZT22-605	Oceanography	3	2			
NBZT22-606	Biotechniques	3	2			

STRUCTURE OF COURSE: B.Sc. III – Zoology

THEORY – No. of papers: Eight, No of practical's: Four, SEMESTER V-Paper IX to XII & SEMESTER VI- Paper XIII to XVI

SEMESTER-V

Theory

Sr. No.	Subject	Marks	Theory	Internal
1	Zoology Paper- IX	50	40	10
2	Zoology Paper- X	50	40	10
3	Zoology Paper- XI	50	40	10
4	Zoology Paper- XII	50	40	10

Practical

1	Practical—V	50
2	Practical—VI	50

SEMESTER-VI

Theory

Sr. No.	Subject	Marks	Theory	Internal
1	Zoology Paper- XIII	50	40	10
2	Zoology Paper- XIV	50	40	10
3	Zoology Paper- XV	50	40	10
4	Zoology Paper- XVI	50	40	10
			Total	300

Practical

1	Practical – VII	50
2	Practical – VIII	50

NBZT22- 501: Paper- IX

COMPARATIVE ANATOMY OF VERTEBRATES

Theory: 30 hrs. (Credits 2)

Course Objectives:

1. The students are expected to acquire the knowledge of systems in animals.
2. To Study the comparative aspects of systems in animals.
3. To understand the generalized structure and evolution of organs.
4. The students are expected to acquire the knowledge of animal adaptations.
5. Understanding the complexity of organs and organ systems, and their interrelationships.

Unit 1: Integumentary System	4
1. Generalized structure of integument	
2. Functions of Integument	
3. Soft epidermal derivatives	
4. Hard epidermal derivatives	
Unit 2: Habitat and anatomical adaptations	4
Unit 3: Digestive System	4
Brief account of alimentary canal and digestive glands	
Unit 4: Respiratory System	4
Brief account of Gills, lungs, air sacs	
Unit 5: Circulatory System	4
Evolution of heart and aortic arches	
Unit 6: Evolution of Kidney	3
Succession of kidney	
Unit 7: Nervous System	3
Comparative account of brain	
Unit 8: Sense Organs	4
Comparative account of ear and eye of vertebrates	

Course Outcomes: After completion, students are able to

1. Students can compare and contrast between different systems of animals.
2. Students can able to identify and describe the no. of system in animals.
3. Students will know about the interrelation in between the organs and organ system in different animals.
4. They can justify and explain the evolutionary trail in different organs and systems in animals.

Suggested Readings:

1. Kardong, K.V. (2005) Vertebrates' Comparative Anatomy, Function and Evolution. IV Edition. McGraw-Hill Higher Education. Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition
2. The McGraw-Hill Companies. Hilderbrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons Walter, H.E. and Sayles, L.P; Biology of Vertebrates, Khosla Publishing House.
3. Outlines of comparative anatomy, Romer & Parsons, Central Book Depot, The Vertebrate Body (Saunders).
4. Biology of Vertebrates Walter & Sayles; (McMillan).
5. Chordate Zoology, P.S. Dhami & J. K. Dhami - R. Chand & Co., New Delhi.
6. Modern Textbook of Zoology, R. L. Kotpal, Rastogi Publications, Meerut.
7. The Life of Vertebrates, 3rd Edition, 1993, J. Z. Young E. L. B.S. Oxford.
8. Chordate Zoology - E.L. Jordan, S. Chand & Co., New Delhi.
9. The Phylum Chordata - 1987, H.H. Newman, Distributor Satish Book Enterprise, Agra. 8. Comparative Anatomy of the Vertebrates G. C. Kent.

NBZT22- 502: Paper X

AQUATIC BIOLOGY AND ENDOCRINOLOGY

Theory: 30 hrs. (Credits 2)

Course Objectives: Student should understand

1. To understand the different concepts of Freshwater Biology.
2. To Study the comparative aspects of different Aquatic biomes
3. To understand the histology and function of endocrine glands.
4. The students are expected to acquire the knowledge of animal adaptations.
5. Understanding the effects of pesticides and aquaculture drugs on the fishes.

Unit 1: Aquatic Biomes

10

- a. Freshwater ecosystem (lakes, wetlands, streams and rivers),
- b. Estuaries
- c. Intertidal zones
- d. Oceanic pelagic zone
- e. Marine benthic zone
- f. Coral reefs

Unit 2: Freshwater Biology

10

1. Lakes
 - a. Lake as an Ecosystem
 - b. Lake Morphometry
 - c. Physico-chemical characteristics
 - i. Light
 - ii. Temperature
 - iii. Thermal Stratification
 - iv. Dissolved solids
 - v. Carbonates
 - vi. Bicarbonates
 - vii. Phosphates and Nitrates
 - viii. Turbidity
 - ix. Dissolved gases (Oxygen and Carbon dioxide)
 - x. Nutrient Cycle – (Nitrogen, Sulphur and Phosphorus)
2. Streams
 - a. Different stages of stream development
 - b. Physico-chemical Environment
 - c. Adaptation of hill stream fishes

Unit 3: Fish Toxicology**02**

- a. Pesticide effect
- b. Aquaculture drugs

Unit 4: Endocrinology**08**

- a. Study of endocrine glands – Anatomy and histology
- b. Hormones- Nature, role, regulation and disorders with reference to the following- Thyroid gland, parathyroid gland, adrenal gland and islets of Langerhans

Course Outcomes: After completion, students are able to

1. Students can compare and contrast between different aquatic biomes.
2. Students can understand all aspects of lakes and streams.
3. Students will know about the interrelation in between the endocrine glands, their hormone and effects.
4. They can justify and explain the hazardous effects of pesticides on freshwater ecology.

Suggested Readings:

1. Anathakrishnan : Bioresources Ecology 3rdEdition
2. Goldman : Limnology, 2ndEdition
3. Dum and Barrett : Fundamentals of Ecology, 5thEdition
4. Pawlowski : Physicochemical Methods for Water and Wastewater Treatment, 1st
5. Edition Wetzel : Limnology, 3rdedition
6. Trivedi and Goyal : Chemical and biological methods for water pollutionstudies
7. Welch : Limnology Vols. I-II
8. Animal Physiology – Nelson (Cambridge)
9. Endocrinology – Hadely
10. General Endocrinology – Bangara and Turner (W.B. Saunders)
11. Reproductive Physiology – Nalbandov A. V.

NBZT22- 503: Paper XI

Bio-techniques and Biostatistics

Theory: 30 hrs. (Credits 2)

Course Objectives: Student should understand

1. To understand the different Biotechniques
2. To Study the various Culture Techniques and Applications in daily life.
3. To understand the process and applications of genetically modified organisms.
4. The students are expected to acquire the knowledge of biostatistics.

Unit 1: Genetically Modified Organisms

09

1. Production of cloned and transgenic animals:
 - a. Nuclear Transplantation
 - b. Retroviral Method
 - c. DNA microinjection
2. Applications of transgenic animals:
 - a. Productions of pharmaceuticals
 - b. Production of donor organs
3. Knockout mice.

Unit 2: Culture Techniques and Applications

06

- a. Animal cell culture: Introduction, principle and applications
- b. Stem Cells: Introduction to stem cells
 - i) Potency of stem cells: Totipotency, Pluripotency, Multipotency, Unipotency
 - ii) Sources of stem cells-Embryo, Fetal, Adult, Bone marrow

Unit 3: Biostatistics

11

- a. Classification of Biological data
- b. Frequency distribution
- c. Tabulation
- d. Graphical representation of data
- e. Measures of central tendency (Mean, Median, Mode)
- f. Dispersion – Mean deviation & standard deviation
- g. Correlation – Scattered diagram, Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient.

Unit 4: Research Tools

04

- a. ANOVA
- b. Chi square test
- c. Student t test
- d. Probability

Course Outcomes: After completion, students are able to

1. Understand the different Genetically Modified Organisms and their application in the society.
2. Students can understand animal cell culture and its applications.
3. Students will know about the Biostatistics and its application in research field

Suggested Readings:

1. Brown, T.A. (1998). Molecular Biology Labfax II: Gene Cloning and DNA Analysis. I Edition, Academic Press, California, USA. Glick, B.R. and Pasternak, J.J. (2009). Molecular Biotechnology- Principles and Applications of Recombinant DNA. IV Edition, ASM press, Washington, USA. Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009).
2. An Introduction to Genetic Analysis. IX Edition. Freeman and Co., N.Y., USA. Snustad, D.P. and Simmons, M.J. (2009).
3. Principles of Genetics. V Edition, John Wiley and Sons Inc. Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007).
4. Recombinant DNA Genes and Genomes- A Short Course. III Edition, Freeman and Co., N.Y., USA. Beauchamp, T.I. and Childress, J.F. (2008).
5. Principles of Biomedical Ethics. VI Edition Oxford University Press.
6. Elements of Biotechnology - P. K. Gupta, Rastogi Publications.
7. Gene V & VI, 1994, Lewin B., Oxford University Press, Oxford.
8. Concept of Genes- Pearson Edition 9. Cell and Molecular Biology

NBZT22- 504: Paper XII

Molecular Cell Biology and Animal Biotechnology Theory: 30 hrs. (Credits 2)

Course Objectives:

1. To build upon the undergraduate level knowledge of basic Molecular Techniques.
2. The course shall make the students aware of various terms and concepts of Molecular Biology.
3. Sensitize the students about basic and fundamental processes in Gene manipulations.
4. Introduce students to the principles, practices and application of animal biotechnology.

Unit 1: Molecular Biology— 07

- 1) DNA Replication (Semi conservative mode)
- 2) DNA Damage and Repair mechanism
- 3) Regulation of gene expression- Operon concept
- 4) Genetic Code:
 - i) Properties of Genetic code
 - ii) Codon assignment
 - iii) Wobble hypothesis

Unit 2: Protein synthesis 08

- A) Transcription
 - i) Process in prokaryotes and eukaryotes
 - ii) RNA polymerase
 - iii) Post transcriptional modification in RNA
- B) Translation in prokaryotes and eukaryotes
 - i) Initiation
 - ii) Elongation
 - iii) Termination

Unit 3: Molecular Techniques in Gene manipulation 15

1. Restriction enzymes: Nomenclature, detailed study of Type II.
2. Characteristics of Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophages
3. Gene cloning: Transformation techniques by Calcium chloride method and electroporation
4. Gene Libraries : Construction of genomic and cDNA libraries
5. Blotting Techniques: Southern, Northern and Western blotting
6. DNA sequencing: Sanger method

7. Polymerase Chain Reaction,
8. DNA Finger Printing
9. DNA microarray
10. ELISA
11. Gene Farming

Course Outcomes: On completion of this course, students should be able to:

1. Gain fundamental knowledge in **Molecular Biology**;
2. Understand the molecular basis of various Techniques used in Molecular biology and biotechnology.
3. Understand to work theoretically and practically with different advanced techniques and instruments used in gene manipulations.

Suggested Readings:

1. Brown, T.A. (1998). Molecular Biology Labfax II: Gene Cloning and DNA Analysis.II Edition, Academic Press, California, USA. Glick, B.R. and Pasternak, J.J.(2009).
2. Molecular Biotechnology - Principles and Applications of Recombinant DNA.IV Edition, ASM press, Washington, USA. Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009).
3. An Introduction to Genetic Analysis. IX Edition. Freeman and Co., N.Y., USA.Snustad, D.P. and Simmons, M.J. (2009).
4. Principles of Genetics. V Edition, John Wiley and Sons Inc. Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007).
5. Recombinant DNAGenes and Genomes- A Short Course. III Edition, Freeman andCo., N.Y., USA. Beauchamp, T.I. and Childress, J.F. (2008).
6. Principles of Biomedical Ethics. VI Edition, Oxford UniversityPress.
7. Cell and Molecular Biology, 8th Edition, De. Robertis EDP and De RobertisJr.EMF, Lippincott Williams andWilkins,Philadelphia.
8. Cell Biology, C.B. Powar, Himalaya PublicationHouse.
9. Cell and Molecular Biology, EJ. Dupraw, Academic Press,New York.
10. Cell Structure and Function - A. G. Loewy, P. Siekevitz, J. R. Meninger& J. A.N. Gallant, SaunderCollege,Philadelphia.
11. Molecular Biology of the Cell - 3rd Edition, Bruce Alberts, Dennis Bray, JulianLewis, Martin Raff, K. Roberts & James D. Watson, Garian Publishing, NewYork

Zoology Practical – V (Credits-02)
NBZP22- 508 Zoology Practical-I (Practical based on NBZT22- 501 & NBZT22- 502)

Learning Objectives-

1. To identify all organs and organ systems of vertebrates.
2. To make students aware about comparative study of different organ systems of vertebrates.
3. To enable students to gain the knowledge of diversity of aquatic life and to understand various aspects of living systems of aquatic biology.
4. Employ scientific methodologies such as experimentation and data analysis in the area of aquatic biology.

Expt. No	Name of the experiment
	Part-I Comparative Study of following
1	V.S. of skin of vertebrates
2	Digestive system of vertebrates
3	Respiratory system of vertebrates
4	Heart of vertebrates
5	Brain of vertebrates
6	Kidney of vertebrates
	Part- II Aquatic Biology.
7	Determination of area of a lake using Graph metric & Gravimetric method
8	Identify the zooplanktons present in lake ecosystem
9	Determination of turbidity or transparency from nearby lake or water body
10	Determination of Dissolved oxygen
11	Determination of free CO ₂
12	Determination of alkalinity (Carbonates & bicarbonates) from water collected from nearby lake or water body
13	Estimation of total hardness of water
14	Instruments used in limnology & their significance a) Secchi disc b) Van Dorn bottle c) Conductivity meter d) Turbidity meter e) PONAR grabs ampler
15	Endocrine Glands (Anatomy & Histology)- Thyroid, Parathyroid, Adrenal and Pancreas.

<p style="text-align: center;">16</p>	<p style="text-align: center;">Study of ecological adaptations</p> <ol style="list-style-type: none"> 1. Lotic 2. Lentic 3. Benthic 4. Pelagic 5. Grassland 6. Desert
<p style="text-align: center;">17</p>	<p>Visit to seashore/water reservoir/animal sanctuary to study animal diversity. Report of tour should be submitted at the time of practical examination</p>

Learning Outcomes:

1. Appreciate the importance of comparative vertebrate biology in understanding our own biology.
2. Student should gain an insight in the fascinating topics like ecological adaptations in animals.
3. Understand the dynamics of aquatic ecosystems and their potential response to changes.
4. Demonstrate skills at identifying organisms found in different aquatic ecosystems.

Zoology Practical –VI (Credits-02)

NBZP22- 509 +Project Practical II (Practical based on NBZT22- 503 & NBZT22- 504)

Learning Objectives-

1. To understand concept and application of Micro techniques and different biotechniques.
2. Biostatistics teaches them to use best data analysis methods in their research projects.
3. To give insights to different blotting techniques.

	Part- III Microtechnique
1	Preparation of permanent histological slides by H-E technique
2	Histochemical techniques <ol style="list-style-type: none">a. AB PH 1 techniqueb. AB PH 2.5 techniquec. PAS technique
3	Biotechniques Chromatography – Separation of amino acid by paper chromatography
4	Isolation of DNA using any suitable material
5	Demonstration of DNA by Feulgen technique
6	To study the following technique (photographs) <ol style="list-style-type: none">a) Southern blottingb) Northern blottingc) Western blottingd) DNA sequencing (Sanger's method)e) PCRf) DNA fingerprinting
	Part- IV Biostatistics
7	Any 10 example based on theory
8	Project (any suitable work possible in local area or from the syllabus) Report of the same to be submitted at the time of practical examination.
9	Submission of online course certificate

Learning Outcomes:

1. Students have gained the knowledge of skills in histological, immunological and physiological techniques.
2. Students have gained the skills in application of micro techniques and different biotechniques.
3. Students have got clear idea about application of internet and statistical bioinformatics in research.

B.Sc. III Zoology SEM- VI

	Theory Papers	Practicals
Compulsory	NBZT22- 601: Developmental Biology of Vertebrates	NBZP22- 608:Zoology Practical-VII (Practical based on NBZT22- 601 & NBZT22- 602)
Elective	NBZT22- 602: Insect Vectors and Histology	
Compulsory	NBZT22- 603: Immunology	NBZP22- 609+ Project: Practical VIII (Practical based on Project+NBZT22- 603 & NBZT22- 604)
Compulsory	NBZT22- 604: Applied Zoology – II	

NBZT22- 601: Paper XIII

Developmental Biology of Vertebrates

Course Objectives:

1. To understand the types of fertilization and process of fertilization.
2. To explain the concept of fertilization and cleavage.
3. To understand early development of frog.
4. Describe the explain organogenesis.

Unit 1: Gametogenesis:

06

1. Types of Eggs
2. Fertilization – Types and Process of Fertilization
3. Types of Cleavages

Unit 2: Early Development of Frog 06

1. Structure of mature egg and its membranes
2. Cleavage
3. Blastula and its fate map
4. Process of gastrulation
5. Types of morphogenic movements
6. Fate of three germinal layers
7. Neurulation
8. Metamorphosis in frog and its hormonal regulation

Unit 3: Chick Embryology

15

1. Structure of sperm
2. Structure of egg and vitellogenesis
3. Fertilization and cleavage
4. Blastula and its fate map
5. Process of gastrulation
6. Organogenesis

Unit 4: Late Embryonic Development

03

1. Implantation of embryo in human being
2. Placenta – Formation, types and significance
3. Foetal membranes and their importance in humans

Course Outcomes:

1. Understand basic concepts of developmental biology.
2. Describe the main anatomical changes that occur during development.
3. Outline and compare the developmental stages which occur in a variety of animals.
4. Identify the cellular behaviour that lead to morphological change during development

Suggested Readings:

1. An Introduction to Embryology 1981, Balinsky B.L., Saunders College, Philadelphia.
2. Developmental Biology; Patterns/Principles/Problems, 1982, Saunders J. W. Collier
3. MacMillan, Publishers, London.
4. Developmental Biology, 1997, 3rd Edition, Gilbert S.F. Saunder Associates Inc. U.S.A.
5. Developmental Biology, 1992 3rd edition, Browder L.W. Erickson C.A. & Williams, R
6. J. Saunders College, Publications, London.
7. A Text Book of Embryology, Dr.Puranik P. G., S. Chand & Co. 6. Developmental
8. Biology, 1984, Browder L.W. , Saunders College Publications, U.S.A.
9. Development of Chick embryo, 1972, Lillie. 8. Developmental Biology, 1991, 3rd
10. Edition, Sinaur Associates, Inc. U.S.A. Gilbert, S. F. (2006).
11. Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers,
12. Sunderland, Massachusetts, USA. Balinsky, B.I. (2008).
13. An introduction to Embryology, International Thomson ComputerPress. Carlson,
14. Bruce M (1996). Patten's Foundations of Embryology, McGraw Hill, Inc.

NBZT22- 602: Paper XIV

Insect Vectors and Histology

Course Objectives:

1. To know about the insect vectors.
2. To understand the mosquito born disease and their control measures.
3. To know about the microscopic structure of cells of mammalian organs.
4. To understand the fly born disease and their control measures.

Unit 1: Dipteran as important insect vectors **06**

- a. Mosquitoes
- b. Sand fly
- c. Houseflies
- d. Horse fly
- e. Black fly
- f. Ticks and Mites

Unit 2: Study of vector borne diseases **12**

1. Mosquito

- a. Malaria
- b. Dengue
- c. Chikungunya
- d. Viral encephalitis
- e. Filariasis

Control measures of Mosquitoes

2. Housefly

- a. Myiasis

Control measures of housefly

Unit 3: Siphonaptera as Disease Vectors **06**

1. Fleas an important insect vectors
2. Host-specificity
3. Study of Flea-borne diseases
 - a. Plague
 - b. Typhus fever
4. Control of fleas

Unit 4: Histology of mammalian organs **06**

Tooth, tongue, Salivary glands, Stomach, Duodenum, Ileum, Liver, Pancreas, Kidney

Course Outcomes:

1. Students have gained the knowledge about insect vectors.
2. Students are now able to understand the mosquito born diseases and their control measures.
3. Students have received the knowledge about the microscopic structure of cells of mammalian organs and their functions.
4. Students are now able to understand the fly born diseases and their control measures.

Suggested Readings:

1. Imms, A.D. (1977). A General Text Book of Entomology. Chapman & Hall, U K
2. Chapman, R.F. (1998). The Insects: Structure and Function. IV Edition, Cambridge University Press, U K
3. Pedigo L.P. (2002). Entomology and Pest Management. Prentice Hall Publication
4. Mathews, G. (2011). Integrated Vector Management: Controlling Vectors of Malaria
5. Insect Vector Borne Diseases. Wiley-Blackwell
6. Textbook of Histology: Bloom W and Fawcett D.W.
7. Histology: Lippincott. Ham, A.W.
8. Histology: Greep, R.O and well, L.
9. An Atlas of Histology. Heinemann Educational Book Ltd. London and ELBS: Freeman. W.H. and Bracegirdle, B.
10. Microscopic Anatomy of vertebrates, Lea and Febigen. Philadelphia: Kendall, J.I.
11. Histology of Mammals: Athavale, M.V and Latey, A. N.

NBZT22- 603: Paper XV

Immunology

Course Objectives:

1. To understand the basic concepts in immunology.
2. To know about vaccination.
3. To know about the cells and organs of immune system.
4. Students will know about the structure and function of antibody.
5. Students will understand antigen-antibody interactions.
6. To understand the Hybridoma technology.

Unit 1: Overview of the Immune System 07

1. Introduction to basic concept in immunology
2. Principles and Classifications of innate and adaptive immune system
3. Immuno-therapeutic strategies against pathogens vaccination

Unit 2: Cells and Organs of the immune system 08

1. Haematopoiesis
2. Lymphocyte synthesis (B Cell, T Cell and Plasma Cells)

Unit 3: Antigens 07

1. Basic properties of antigens
2. B and T cell epitopes

Unit 4: Immunoglobulin/Antibodies 08

1. Structure, Classes and Functions of Antibodies
2. Antigen – Antibody interactions
3. Hybridoma Technology: Monoclonal Antibodies in diagnosis and therapeutics
4. Inflammations

Course Outcomes:

1. Students have gained the knowledge about basic concepts in immunology.
2. Students will understand the concept of vaccination.
3. Students will get the proper knowledge about cells and organs of immune system.
4. Students have gained the knowledge of structure and function of antibody.
5. Students will able to understand antigen-antibody interactions.

Suggested Readings:

1. Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). Immunology, VI Edition. W.H. Freeman and Company. David, M., Jonathan, B., David, R. B. and Ivan R. (2006).
2. Immunology, VII Edition, Mosby, Elsevier Publication. Abbas, K. Abul and Lechtman.

3. H. Andrew (2003.) Cellular and Molecular.
4. Immunology. V Edition. Saunders Publication.

NBZT22- 604: Paper XVI

Applied Zoology – II

Course Objectives:

1. To maintain the small apiaries for demonstration, pollination, extraction and by-product of beekeeping.
2. To know about the proper management of the domestic animals.
3. To know about the indigenous and exotic breeds of domestic animals

Unit1: Apiculture

08

1. Types and casts of honey bee
2. Honey Comb
3. Bee Keeping
 - a. Artificial model of bee hive –Langstroth models
 - b. Bee keeping Equipments
 - c. Extraction of Honey
 - d. Importance of Bee products

Unit 2: Animal Husbandry

08

1. Indigenous and exotic breeds of cattle
2. Preservation and artificial insemination in cattle
3. Induction of early puberty
4. Synchronization of estrus in cattle
5. Commercial importance of dairy farming
6. Production and marketing of milk products

Unit 3: Pearl culture

04

1. Species of oyster
2. Process of Pearl formation: natural and artificial
3. Maintenance of oysters
4. Harvesting
5. Importance of Pearl

Unit 4: Freshwater prawn culture

05

1. Species of Prawn
2. Site selection
3. Farm Construction
4. Production system: fertilization, Larval Development, Food and feeding
5. Harvesting

Unit 5: Fish Technology

05

Genetic improvements in aquaculture industry:

1. Induced breeding
2. Transportation of fish seed
3. Feeding and development
4. Harvesting and Marketing

Course Outcomes:

1. Students are now able to handle bee keeping system and bee keeping management.
2. Students have gained knowledge about bee colony management.
3. Students will develop the management for the production of the domestic animals.
4. Students have gained knowledge about nutrition of domestic animals to increase the milk production.
5. Students will get the knowledge about process of pearl formation.

Suggested Readings:

1. Mollusca - Hyman.
2. Prawn and Prawn Fishery of India - Kurian.
3. Fish Culture - K. H. Alikuhni.
4. Fish Culture - Lagter.
5. Fishes of India. - Khanna.
6. Hand Book of Animal Husbandry and Dairy - Mudlyer.
7. Bee keeping in India - Sardar Sing.
8. Bee Keeping in India- M. G. Smith.
9. Poultry keeping in India - Naidu P.N.M.
10. Poultry Husbandry - M. A. Jule. 18. Poultry Husbandry - Moarthy.
11. Outlines of Dairy Technology - Sukumar De.
12. Milk and milk products - Clarence Henry Eckles, Willes Barnes Combs, Harold Macy

NBZP22- 608: ZOOLOGY PRACTICAL – VII (Credits-02)

Zoology Practical-III (Practical based on NBZT22- 601 & NBZT22- 602)

Course Objectives: Student should understand

1. To understand the different developmental stages of frog.
2. To explain the concept of fertilization and cleavage.
3. To understand early development of Chick embryo.
4. Identify the basics of arthropods of public health importance.
5. To study Histology and functions of mammalian organs

I:Developmental Biology of Vertebrates:

II. Study of developmental stages of frog.

1. Cleavage
2. Blastulation
3. Gastrulation
4. Neurulation
5. Stages of metamorphosis in frog
 - a. External gill stage
 - b. Internal gill stage
 - c. Forelimb stage
 - d. Hind limb stage
 - e. Tail bud stage
 - f. Juvenile stage

III. Study of Chick Embryo

1. Whole mount of chick embryo – 18, 24, 33, 48 and 72hours.
2. T.S. of chick embryo – 18, 24, 33, 48 and 72hours.

III. Preparation of whole mount chick embryo.

IV. Study of Histological structures of placenta(permanent slide or microphotographs)

- 1) Epitheliochorial
- 2) Endotheliochorial
- 3) Hemochorial
- 4) Syndesmochorial
- 5) Hemoendothelial

V. Study of Gametes– Frog or Rat sperm & ovum through slides or microphotographs.

II: Insect Vectors & Diseases:

I. Study of different kinds of mouthparts of insects

1. Chewing & biting
2. Chewing & lapping
3. Piercing & sucking
4. Sponging
5. Siphoning

II. Study of following insect vectors through permanent slides or photograph

1. Insect vector – Mosquito, sand fly & housefly

2. Study of mosquito borne diseases – Malaria, dengue, chikungunya, encephalitis, filariasis
3. Study of sand fly borne diseases – *Visceral leishmanians*, *Cutaneous leishmanians*, Phlebotomus fever
4. Study of housefly borne diseases – Myiasis
5. Study of flea borne diseases – Plague, typhus

III. . Histology of following mammalian organs-

- a) Tooth (V.S.)
- b) Tongue
- c) Salivary gland
- d) Stomach
- e) Duodenum
- f) Ileum
- g) Liver
- h) Pancreas
- i) Kidneys

Course Outcomes: After completion, students are able to

1. To understand the developmental stages of frog.
2. Will gained the knowledge of early development of Chick embryo.
3. Will understand the Insect vectors, their mode and preventive measures.

ZOOLOGY PRACTICAL – VIII (CREDITS-02)

NBZP22-609 + Project: Practical IV (Practical based on Project+NBZT22- 603 & NBZT22-604)

1. To understand the concepts of Apiculture, bee keeping equipments.
2. Introduce and describe the pearl culture and fresh water prawn culture.
3. Understand basic histology of glands related to immunity.
4. Introduction and description of Goat farming.

I) Applied Zoology

1. Apiculture:

- a. Life cycle and casts of Honey Bees
- b. Bee Hive (Photographs or models)
- c. Pollen Basket
- d. Sting Apparatus
- e. Honey
- f. Newton's model of Bee Hive (Photographs or models)
- g. Bee keeping Equipments (Photographs or models)

2. Preservation & Artificial insemination in cattle's

3. Pearl culture

- a. Species of oyster
- b. Process of Pearl formation: natural and artificial
- c. Importance of Pearl

4. Freshwater prawn culture

- a. Species of Prawn
- b. Site selection
- c. Farm Construction
- d. Production system
- e. Harvesting

5. Goat farming

- a. Breeds (any four = 2 Indigenous and 2 Exotic)
- b. Housing
- c. Feeding

6. Economic importance of Milk and Milk by products

7. Visit to goat farm or animal breeding centre – submission of visit report

II) Immunology

1. Study of lymphoid organ's (Photograph, Models, Videos)
2. Histological study of (slides or photographs)
 - a. Spleen
 - b. Thymus
 - c. Lymph nodes
3. Preparation of stained blood smears to study various types of blood cells
4. Determination of ABO blood groups.
5. Demonstration of
 - a. ELISA

- b. Immuno-electrophoresis
- 6. Cell counting and viability test from splenocytes of farm breed animals / cell line

III)PROJECT

Course Outcomes: After completion, students are able to

1. Define the concepts of the applied subjects like Apiculture, Prawn culture and goat farming.
2. Able to plan their own startups or set up of Apiculture, Prawn culture and goat farming.
3. Able to practically use different immune histochemical instruments.
4. Be able to clearly state the role of the immune system.

THEORY PAPER PATTERN

Seat No.....

Rayat Shikshan Sanstha's
Sadguru Gadage Maharaj College, Karad
(An Autonomous College)
Affiliated to Shivaji University, Kolhapur
SEE Examination, Oct. /Nov. -
Course Name- B. Sc. III Sem.
Subject - Zoology (Paper)
Subject Code No. -:

Day & Date- , / /20
Time- to

Marks-40

Instructions: 1) All questions are compulsory.
2) Draw neat and labelled diagram wherever necessary.
3) Figures to the right indicated full marks.

Q. 1 Multiple choice questions **(8)**

- a)
- b)
- c)
- d)
- e)
- f)
- g)
- h)

Q. 2 Long answer questions (Any Two) **(16)**

- a)
- b)
- c)

Q. 3 Write short note (Any Four) **(16)**

- a)
- b)
- c)
- d)
- e)
- f)

PRACTICAL PAPER PATTERN

Seat No.....

Rayat Shikshan Sanstha's
Sadguru Gadage Maharaj College, Karad
(An Autonomous College)
Affiliated to Shivaji University, Kolhapur
SEE Examination, Oct. /Nov. -
Course Name- B. Sc. III Sem.
Subject - Zoology (Paper)
Subject Code No. - :

Day & Date- , / /20
Time- to

Marks-50

Q.1 Major Experiment	12
Q.2 Major Experiment	12
Q.3 Identification	10
Q.4 Minor Experiment	06
OR	
Minor Experiment	
Q.5 Viva – voce	05
Q.6 Journal	05