

**SRR & CVR GOVERNMENT DEGREE COLLEGE  
(AUTONOMOUS)**

**MACHAVARAM, VIJAYAWADA-520004**

**DEPARTMENT OF ZOOLOGY**



**Minutes of  
Up gradation of Syllabus Meeting  
(Board of Studies in Zoology)**

**(2021-22)**

**Dated: 02/12/2021**

**Courses**

II B.Sc-BZC (Zoology): Semester III & IV (w.e.f-2021-22)  
*Skill Development Course: Poultry Farming (In semester III)*  
*(As per APSCHE and CBCS Pattern Semester System)*

III B.Sc-BZC, EATZC (Zoology & Aquaculture): Semester V & VI

**Subjects:**

**ZOOLOGY & AQUACULTURE TECHNOLOGY**

**SYLLABUS, BLUE PRINT & MODEL QUESTION PAPERS**



# S.R.R. & C.V.R. GOVT. DEGREE COLLEGE

Autonomous & ISO900: 2015 Certified Institution,  
NIRF -2020 ranked 101-150 band and NIRF - 2019: 151-200 rank band Institution

NAAC accredited with 'B+' Grade

Machavaram, VIJAYAWADA - 520 004. Krishna District.

Cell : 9440630271 Ph : 0866-2430060, Fax : 0866-2441092, www.srrcvr.org, srrandcvr@gmail.com



## MINUTES OF UP GRADATION OF SYLLABUS MEETING (BOARD OF STUDIES IN ZOOLOGY)

The meeting of the Board of Studies in the subject of **ZOOLOGY** was held on **02<sup>nd</sup> December 2021** in the **Zoology Department** of the college for the up gradation of the syllabus for **II B.Sc BZC Zoology subject syllabus for Semester III & IV and Skill Development Course- Poultry Farming in semester III as per the new syllabus proposed by APSCHE with CBCS pattern and semester system, III.B.Sc BZC, EATZC Zoology and Aquaculture Technology subjects syllabus for Semester V & VI** under the chairmanship of Dr. M.Vijaya Kumar, Head of the Zoology Department.

**The following members attended the meeting:**

- 1. Dr. M.VIJAYA KUMAR** (In-charge of the Department & Chairman, BOS)  
Lecturer in Zoology  
SRR & CVR GDC (A)  
Vijayawada
- 2. Dr.J.NAVEENA LAVANYA LATHA** (University Nominee)  
Krishna University  
Machilipatnam
- 3. Dr. N. ANKAMMA** (Subject Expert)  
Associate Professor,  
Department of Zoology,  
Govt. College for Women (Autonomous),  
Guntur.A.P
- 4. Dr.G.VANI** (Subject Expert)  
Lecturer in Zoology,  
DRG Government Degree College  
Tadepalligudem.  
West Godavari District. A.P

**5. Sri. B.APPALA NAIDU**

**(Industrial Expert )**

Assistant Project Manager-Tilapia Fish Project  
Rajiv Gandhi centre for Aquaculture (RGCA)  
Manikonda

**6. N.SUNEETHA**

**(Faculty Member)**

Lecturer in Zoology  
SRR & CVR GDC (A),  
Vijayawada

**7. A.L.K.KRUPAVARM**

**(Faculty Member)**

Lecturer in Zoology  
SRR & CVR GDC (A),  
Vijayawada

**8. B.VADAVATHI**

**(Faculty Member)**

Lecturer in Zoology  
SRR & CVR GDC (A),  
Vijayawada



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## MINUTES OF UP GRADATION OF SYLLABUS MEETING (BOARD OF STUDIES IN ZOOLOGY)

The meeting of the Board of Studies in the subject of **ZOOLOGY** was held on **02<sup>nd</sup> December 2021** in the **Zoology Department** of the college for the up gradation of the syllabus for **II B.Sc BZC Zoology subject syllabus for Semester III & IV and Skill Development Course- Poultry Farming in semester III** as per the new syllabus proposed by **APSCH** with **CBCS pattern and semester system, III.B.Sc BZC, EATZC Zoology and Aquaculture Technology subjects syllabus for Semester V & VI** under the chairmanship of **Dr. M.Vijaya Kumar**, Head of the Zoology Department.

The following members attended the meeting:

1. **Dr. M.VIJAYA KUMAR**

(In-charge of the Department & Chairman, BOS)

Lecturer in Zoology

SRR & CVR GDC (A)

Vijayawada

2. **Dr.J.NAVEENA LAVANYA LATHA**

Krishna University

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3. **Dr. N. ANKAMMA**

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Tadepalligudem.

West Godavari District. A.P

*M. Vijaya Kumar*

*J. Naveena Lavanya Latha*  
(University Nominee)

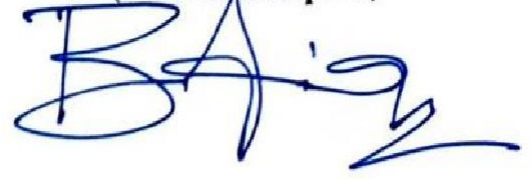
*N. Ankamma*  
(Subject Expert)

(Subject Expert)

*G. Vani*

5. **Sri. B.APPALA NAIDU**  
Assistant Project Manager-Tilapia Fish Project  
Rajiv Gandhi centre for Aquaculture (RGCA)  
Manikonda

(Industrial Expert)



6. **N.SUNEETHA**  
Lecturer in Zoology  
SRR & CVR GDC (A),  
Vijayawada

N. Suneetha  
(Faculty Member)

7. **A.L.K.KRUPAVARM**  
Lecturer in Zoology  
SRR & CVR GDC (A),  
Vijayawada

A.L.K. Krupavaram  
(Faculty Member)

8. **B.VADAVATHI**  
Lecturer in Zoology  
SRR & CVR GDC (A),  
Vijayawada

B. Vadavathi  
(Faculty Member)

## AGENDA

1. Approval of the Syllabus, Model Question paper, Blue Print of the following
  - A. II B.Sc-BZC (Zoology): Semester III & IV (w.e.f-2021-22)
  - B. *Skill Development Course: Poultry Farming* (In semester III)  
(As per APSCHE and CBCS Pattern Semester System)
  - C. III B.Sc-BZC, EATZC (Zoology & Aquaculture): Semester V & VI
2. Approval of the stipulated Credits, Work Load, Internal Marks breakup etc...
3. Approval of Online Examination pattern in case COVID 19 doesn't subside at the time of Examinations (MCQs Pattern).

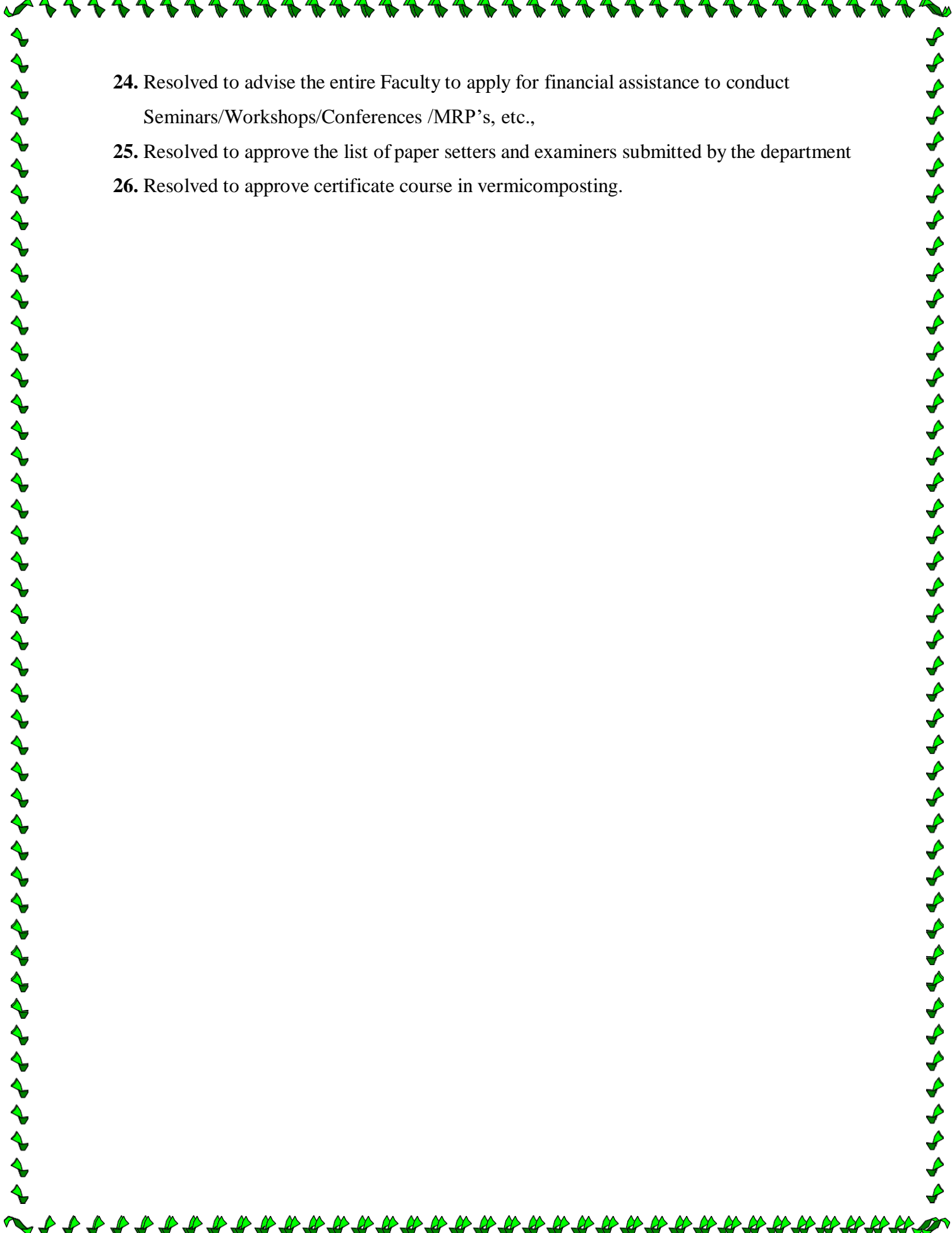
The Chairperson of the Board of Studies welcomed the members and initiated discussion on the Agenda. He apprised the members about the guidelines of the UGC, APSCHE, Krishna University and the CCE regarding the framing of syllabus and the recommended evaluation ratio for internal and external examinations. The members discussed in detail the various aspects presented before them and unanimously resolved the following:

The members of the BOS resolved

## RESOLUTIONS

1. Resolved to approve the syllabus for II.B.Sc BZC Zoology subject for Semester III & IV as per the new syllabus proposed by APSCHE and CBCS Pattern Semester System with effect from 2021-22.
2. Resolved to approve the syllabus for first year Skill Development Course- Paper Title- Poultry farming in semester III as per the new syllabus APSCHE and CBCS Pattern Semester System with effect from 2021-22.
3. Resolved to adopt the same syllabus as approved in the previous BOS for III B.Sc-BZC and EATZC Zoology and Aquaculture Technology subjects for Semester V and VI
4. Resolved to conduct project work at field/industry/training Centre for Paper V and Paper VI in aquaculture subject for EATZC instead of practical.
5. Resolved to award assignment 10 marks for Paper V and Paper VI in aquaculture subject if the student attends any five online aquaculture related webinars and produce the E-certificate and write up of the webinars.
6. Resolved to approve the Model Question paper, Blue Print and Question Bank for the above approved syllabus.

7. Resolved to approve Online Examination pattern in case COVID 19 doesn't subside at the time of Examinations (MCQs Pattern).
8. Resolved to approve the duration of the Examination for 3 hours.
9. Resolved to approve the division of marks for internal and external examination along with the suggested blue print and model paper.
10. Resolved to approve the division of 100 marks into two components for Theory, External 60 Marks as Section-A consisting 20 Marks with Short Answer questions (Any 5 from given 10), Section-B consisting 40Marks with Essay Questions (Any 5 with internal choice from given 10)
11. Resolved to approve the division of Internal 40Marks to evaluate Internal Assessment as Two Internal exams for 10 marks, Two Assignments for 10 marks, Project work for 10 marks, Seminar for 10 marks for Total of 40 marks
12. The pass mark is 40% i.e., 24 out of 60 for External and 16 out of 40 for Internal.
13. Resolved to approve the division of 50 marks into two components for Practicals, External 25 Marks as Major Experiment for 8 marks, Minor experiment for 4 marks, Identification for spotters for 8 marks, Viva voce for 5 marks.
14. Resolved to approve the division of Internal 25 Marks as Assessment for 10 marks, Record for 10 marks, Field note book for 5 marks
15. The pass mark is 40% i.e., 10 out of 25 for each External and Internal.
16. Resolved to approve the skill development course evaluation for 50 marks at the end of the semester III The pass mark to be 40% i.e., 20marks out of 50 marks.
17. Resolved to conduct Bridge Course for one week to the newly joined first year students.
18. Resolved to use Virtual class room, ICT, Computer/Internet assisted learning for students regularly for teaching learning process.
19. Resolved to conduct student centric activities like Quiz, Group discussion etc
20. Resolved to arrange Field trips Surveys, Society outreach programmes etc.
21. Resolved to conduct Guest Lectures, Student Seminars, Study Projects etc
22. Resolved to give Assignments in the form of Critical, Innovative, Text book and Internet based.
23. Resolved to use Learning Management System LMS developed by CCE, AP

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24. Resolved to advise the entire Faculty to apply for financial assistance to conduct  
Seminars/Workshops/Conferences /MRP's, etc.,
  25. Resolved to approve the list of paper setters and examiners submitted by the department
  26. Resolved to approve certificate course in vermicomposting.

**Course code:**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc BZC**

**ZOOLOGY SYLLABUS**

(w.e.f. 2020-21) (Revised in April, 2020)

**SEMESTER III**

**PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND  
EVOLUTION**

**HOURS: 60**

**Max. Marks: 100**

**Course Outcomes:**

The overall course outcome is that the student shall develop deeper understanding of what life is and how it functions at cellular level. This course will provide students with a deep knowledge in Cell Biology, Animal Biotechnology and Evolution and by the completion of the course the graduate shall able to –

- CO1** To understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.
- CO2** Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.
- CO3** To understand the history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals
- CO4** Acquiring in-depth knowledge on various aspects of genetics involved in sex determination, human karyotyping and mutations of chromosomes resulting in various disorders
- CO5** Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins.
- CO6** Understand the principles and forces of evolution of life on earth, the process of evolution of new species and apply the same to develop new and advanced varieties of animals for the benefit of the society

**Learning Objectives**

- To understand the origin of cell and distinguish between prokaryotic and eukaryotic cell
- To understand the role of different cell organelles in maintenance of life activities
- To provide the history and basic concepts of heredity, variations and gene interaction
- To enable the students distinguish between polygenic, sex-linked, and multiple allelic modes of inheritance.
- To acquaint student with basic concepts of molecular biology as to how characters are expressed with a coordinated functioning of replication, transcription and translation in all living beings
- To provide knowledge on origin of life, theories and forces of evolution
- To understand the role of variations and mutations in evolution of organisms

**Course code:**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc BZC**

**ZOOLOGY SYLLABUS**

(w.e.f. 2020-21) (Revised in April, 2020)

**SEMESTER III**

**PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION**

**HOURS: 60**

**Max. Marks: 100**

**Unit – I Cell Biology**

- 1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma
  - 1.2 Electron microscopic structure of animal cell.
  - 1.3 Plasma membrane – Models and transport functions of plasma membrane.
  - 1.4 Structure and functions of Golgi complex, Endoplasmic Reticulum and Lysosomes
  - 1.5 Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes
- (Note: 1. General pattern of study of each cell organelle – Discovery, Occurrence, Number, Origin, Structure and Functions with suitable diagrams)

**2. Need not study cellular respiration under mitochondrial functions)**

**Unit – II Genetics - I**

- 2.1 Mendel's work on transmission of traits
- 2.2 Gene Interaction – Incomplete Dominance, Codominance, Lethal Genes
- 2.3 Polygenes (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance)
- 2.4 Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo-diploidy types of sex determination)
- 2.5 Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)

**Unit – III Genetics - II**

- 3.1 Mutations & Mutagenesis
- 3.2 Chromosomal Disorders (Autosomal and Allosomal)
- 3.3 Human Genetics – Karyotyping, Pedigree Analysis (basics)
- 3.4 Basics on Genomics and Proteomics

**UNIT IV: Molecular Biology**

- 4.1 Central Dogma of Molecular Biology
- 4.2 Basic concepts of -
  - a. DNA replication – Overview (Semi-conservative mechanism, Semi-discontinuous mode, Origin & Propagation of replication fork)
  - b. Transcription in prokaryotes – Initiation, Elongation and Termination, Post-transcriptional modifications (basics)
  - c. Translation – Initiation, Elongation and Termination
- 4.3 Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes

**Additional input: Structure of DNA**

**Unit - V**

- 5.1 Origin of life
- 5.2 Theories of Evolution: Lamarckism, Darwinism, Germ Plasm Theory, Mutation Theory
- 5.3 Neo-Darwinism: Modern Synthetic Theory of Evolution, Hardy-Weinberg Equilibrium
- 5.4 Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection, Speciation

### Co-curricular activities (Suggested)

- Model of animal cell
- Working model of mitochondria to encourage creativity among students
- Photo album of scientists of cell biology
- Charts on plasma membrane models/cell organelles
- Observation of Mendelian / Non-Mendelian inheritance in the plants of college botanical garden or local village as a student study project activity
- Observation of blood group inheritance in students, from their parents and grand parents
- Karyotyping and preparation of pedigree charts for identifying diseases in family history
- Charts on chromosomal disorders
- Charts on central dogma/lac operon/genetic code
- Model of semi-conservative model of DNA replication
- Model of tRNA and translation mechanism
- Power point presentation of transcription or any other topic by students
- Draw geological time scale and highlight important events along the time line
- Chart on industrial melanism to teach directed selection, Darwin's finches to teach genetic drift, collection of data on weight of children born in primary health centres to teach stabilizing selection etc.

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15. Hall, B. K. and Hallgrimsson, B. (2008). Evolution. IV Edition. Jones and Bartlett Publishers
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**Course code:**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc BZC**

(w.e.f. 2020-21) (Revised in April, 2020)

**SEMESTER III**

**ZOOLOGY PRACTICAL SYLLABUS**

**PAPER - III**

**CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION**

**Periods: 24**

**Max. Marks: 50**

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**Learning Objectives:**

- Acquainting and skill enhancement in the usage of laboratory microscope
- Hands-on experience of different phases of cell division by experimentation
- Develop skills on human karyotyping and identification of chromosomal disorders
- To apply the basic concept of inheritance for applied research
- To get familiar with phylogeny and geological history of origin & evolution of animals

### **I. Cell Biology**

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis and Meiosis with prepared slides
3. Mounting of salivary gland chromosomes of *Chironomus*

### **II. Genetics**

1. Study of Mendelian inheritance using suitable examples and problems
2. Problems on blood group inheritance and sex linked inheritance
3. Study of human karyotypes (Down's syndrome, Edwards, syndrome, Patau syndrome, Turner's syndrome and Klinefelter syndrome)

### **III. Evolution**

1. Study of fossil evidences
2. Study of homology and analogy from suitable specimens and pictures
3. Phylogeny of horse with pictures
4. Study of Genetic Drift by using examples of Darwin's finches (pictures)
5. Visit to Natural History Museum and submission of report



## REFERENCE BOOKS

1. Burns GW. 1972. *The Science of Genetics. An Introduction to Heredity*. Mac Millan Publ. Co.Inc.
2. Gardner EF. 1975. *Principles of Genetics*. John Wiley & Sons, Inc. New York.
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4. Levine L. 1969. *Biology of the Gene*. Toppan.
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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc BZC  
ZOOLOGY SYLLABUS**

(w.e.f. 2020-21) (Revised in April, 2020)

**SEMESTER III**

**PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND  
EVOLUTION**

**Zoology Theory- Internal**

**Total Marks: 40**

- |                          |   |              |
|--------------------------|---|--------------|
| 1. Project               | : | 10 marks     |
| 2. Assignments (2)       | : | 5x2=10 marks |
| 3. Internals (2) Average | : | 10 marks     |
| 4. Seminar               | : | 10 marks     |

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc BZC  
ZOOLOGY SYLLABUS**

(w.e.f. 2020-21) (Revised in April, 2020)

**SEMESTER III**

**PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND  
EVOLUTION**

**Time: 3 Hours**

**Total Marks: 60**

**Zoology Theory- External**

**Section –A**

- |   |        |
|---|--------|
| I. Short Answer questions 1 to 10 (Any 5 from given 10) | 5x4=20 |
|---|--------|

**Section –B**

- |   |        |
|---|--------|
| II. Essay Questions 11 to 15 (With internal choice) | 5x8=40 |
|---|--------|

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc (B.Z.C) ZOOLOGY**

**PRACTICAL MARKS ALLOTMENT**

**SEMESTER III**

**PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION**

**Zoology Practical's - External**

**Time: 3 hrs.**

**Total Marks: 25**

- |   |   |                   |
|---|---|-------------------|
| 1. Major dissection demonstration only        | : | 8 marks           |
| (Identification-2M; Diagram-3M; Labelling-3M) |   |                   |
| 2. Mounting (2)/Minor dissection (1)          | : | 4 marks (2+2)     |
| 3. Identification (2)                         | : | 5 marks (2x2 1/2) |
| 4. Record                                     | : | 5 marks           |
| 5. Viva voce                                  | : | 3 marks           |

**Zoology Practical's - Internal**

**Total Marks: 25**

- |                                   |   |         |
|-----------------------------------|---|---------|
| 1. Assessment including viva voce | : | 6 marks |
| 2. Record                         | : | 6 marks |
| 3. Field note book                | : | 5 marks |
| 4. Project                        | : | 8 marks |

**Question Paper Blue Print**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc (B.Z.C) ZOOLOGY THEORY**

**SEMESTER III**

**PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND  
EVOLUTION**

**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A: Short Questions : 5 x 4 = 20**

Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

**Section-B: Essay Questions : 5 x 8 = 40**

Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

**Total : 60 Marks**

**Model Question Paper**

**Course code:**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc BZC**

**ZOOLOGY**

**SEMESTER III**

**PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND  
EVOLUTION**

**Time: 3Hrs**

**Max Marks: 60**

**SECTION-A**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x4=20**

1. Difference between Prokaryotic and Eukaryotic cell
2. Types of Chromosomes
3. Incomplete dominance
4. X-Linked Inheritance
5. Autosomal disorders
6. Factors influencing mutation
7. DNA transcription in Prokaryotes
8. Lac Operon
9. Genetic drift
10. Neo-Darwinism

**SECTION-B**

**II. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x8=40**

11.a. Explain the structure and functions of Plasma membrane

OR

b. Write about the structure and functions of Mitochondria

12.a. Give a detailed account on Mendel's transmission of traits

OR

b. Describe the chromosomal sex determination

13.a. Write about the Autosomal and Allosomal disorders

OR

b. Give a detailed account on Genomics and Proteomics

14.a. Explain the Translation mechanism in Prokaryotic cells

OR

b. What is DNA Replication write about the semi conservative and semi discontinuous mechanism of DNA

15.a. Explain the Charles Darwin theory of Evolution.

OR

b. Describe the Isolation mechanisms

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**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**II B.Sc BZC**  
**ZOOLOGY**  
**SEMESTER IV**

**PAPER – IV: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY**

**HOURS : 60**

**Max. Marks: 100**

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**Course Outcomes:**

This course will provide students with a deep knowledge in Physiology, Cellular metabolism and Molecular Biology and by the completion of the course the graduate shall be able to –

**CO1** Understand the functions of important animal physiological systems including digestion, cardio-respiratory and renal systems.

**CO2** Understand the muscular system and the neuro-endocrine regulation of animal growth, development and metabolism with a special knowledge of hormonal control of human reproduction.

**CO3** Describe the structure, classification and chemistry of biomolecules and enzymes responsible for sustenance of life in living organisms

**CO4** Develop broad understanding the basic metabolic activities pertaining to the catabolism and anabolism of various biomolecules

**CO5** Describe the key events in early embryonic development starting from the formation of gametes upto gastrulation and formation of primary germ layers.

**Learning Objectives**

- To achieve a thorough understanding of various aspects of physiological systems and their functioning in animals.
- To instil the concept of hormonal regulation of physiology, metabolism and reproduction in animals.
- To understand the disorders associated with the deficiency of hormones
- To demonstrate a thorough knowledge of the intersection between the disciplines of Biology and Chemistry.
- To provide insightful knowledge on the structure and classification of carbohydrates, proteins, lipids and enzymes
- To demonstrate an understanding of fundamental biochemical principles such as the function of biomolecules, metabolic pathways and the regulation of biochemical processes
- To make students gain proficiency in laboratory techniques in biochemistry and orient them to apply the scientific method to the processes of experimentation and hypothesis testing.

Course code:

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

II B.Sc BZC

ZOOLOGY

SEMESTER IV

PAPER – IV: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY

HOURS: 60 (5X12)

Max. Marks: 100

**UNIT I Animal Physiology - I**

- 1.1 Process of digestion and assimilation
- 1.2 Respiration - Pulmonary ventilation, transport of oxygen and CO<sub>2</sub>  
(Note: Need not study cellular respiration here)
- 1.3 Circulation - Structure and functioning of heart, Cardiac cycle
- 1.4 Excretion - Structure and functions of kidney urine formation, counter current Mechanism

**UNIT II Animal Physiology - II**

- 2.1 Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers
- 2.2 Muscle contraction - Ultra structure of muscle, molecular and chemical basis of muscle contraction
- 2.3 Endocrine glands - Structure, functions of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas
- 2.4 Hormonal control of reproduction in a mammal

Additional input: Neurotransmitters

**UNIT III Cellular Metabolism – I (Biomolecules)**

- 3.1 Carbohydrates - Classification of carbohydrates. Structure of glucose
- 3.2 Proteins - Classification of proteins. General properties of amino acids
- 3.3 Lipids - Classification of lipids
- 3.4 Enzymes: Classification and Mechanism of Action

**UNIT IV Cellular Metabolism – II**

- 4.1 Carbohydrate Metabolism - Glycolysis, Krebs cycle, Electron Transport Chain, Glycogen metabolism, Gluconeogenesis
- 4.2
- 4.3 Lipid Metabolism –  $\beta$ -oxidation of palmitic acid
- 4.4 Protein metabolism - Transamination, Deamination and Urea Cycle

**Unit – V Embryology**

- 5.1 Gametogenesis
- 5.2 Fertilization
- 5.3 Types of eggs
- 5.4 Types of cleavages
- 5.5 Development of Frog upto formation of primary germ layers

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### **Co-curricular activities (Suggested)**

- Chart on cardiac cycle, human lung, kidney/nephron structure etc.
- Working model of human / any mammalian heart.
- Chart of sarcomere/location of endocrine glands in human body
- Chart affixing of photos of people suffering from hormonal disorders
- Student study projects such as identification of incidence of hormonal disorders in the local primary health centre, studying the reasons thereof and measures to curb or any other as the lecturer feels good in nurturing health awareness among students
- Chart on structures of biomolecules/types of amino acids (essential and non-essential)Chart preparation by students on Glycolysis / kreb's cycle/urea cycle etc.
- Model of electron transport chain
- Preparation of models of different types of eggs in animals
- Chart on frog embryonic development, fate map of frog blastula, cleavage etc.

### **REFERENCE BOOKS**

1. Eckert H. *Animal Physiology: Mechanisms and Adaptation*. W.H. Freeman & Company.
2. Flory E. *An Introduction to General and Comparative Animal Physiology*. W.B. Saunders Co., Philadelphia.
3. Goel KA and Satish KV. 1989. *A Text Book of Animal Physiology*, Rastogi Publications, Meerut, U.P.
4. Hoar WS. *General and Comparative Physiology*. Prentice Hall of India, New Delhi.
5. Lehninger AL. Nelson and Cox. *Principles of Biochemistry*. Lange Medical Publications, New Delhi.
6. Prosser CL and Brown FA. *Comparative Animal Physiology*. W.B. Saunders Company, Philadelphia.
7. *Developmental Biology* by Balinsky
8. *Developmental Biology* by Gerard Karp
9. *Chordate embryology* by Varma and Agarwal
10. *Embryology* by V.B. Rastogi
11. Austen CR and Short RV. 1980. *Reproduction in Mammals*. Cambridge University Press.
12. Gilbert SF. 2006. *Developmental Biology*, 8<sup>th</sup> Edition. Sinauer Associates Inc., Publishers, Sunderland, USA.
13. Longo FJ. 1987. *Fertilization*. Chapman & Hall, London.
14. Rastogi VB and Jayaraj MS. 1989. *Developmental Biology*. KedaraNath Ram Nath Publishers, Meerut, Uttar Pradesh.
15. Schatten H and Schatten G. 1989. *Molecular Biology of Fertilization*. Academic Press, New York.

Model Question Paper

Course code:

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

II B.Sc BZC

ZOOLOGY

SEMESTER IV

PAPER – IV: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND  
EMBRYOLOGY

Time: 3Hrs

Max Marks: 60

**SECTION-A**

I. Answer any FIVE of the following

Draw labeled diagram wherever necessary

5x4=20

1. Cardiac cycle
2. Nephron structure
3. Resting membrane potential
4. Pancreas
5. Glucose structure
6. Properties of amino acids
7. Types of eggs
8. Types of Cleavages
9. Transamination
10. Deamination

**SECTION-B**

II. Answer any FIVE of the following

Draw labeled diagram wherever necessary

5x8=40

- 11.a. Explain the process of Digestion  
OR  
b. Describe the structure and functioning of the heart
- 12.a. Explain the ultrastructure of muscle and process of muscle contraction  
OR  
b. Explain the structure and functions of Pituitary gland
- 13.a. Explain the classification of carbohydrates  
OR  
b. Explain the classification of lipids
- 14.a. Explain beta oxidation of palmitic acid  
OR  
b. Explain electron transport chain
- 15.a. Explain development of frog up to formation of primary germ layers  
OR  
b. Explain the process of fertilization

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc BZC**

**ZOOLOGY PRACTICAL SYLLABUS**

**SEMESTER IV**

**PAPER – IV: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY**

**Periods: 24**

**Max. Marks: 50**

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**Learning Objectives:**

- Identification of an organ system with histological structure
- Deducing human health based on the information of composition of blood cells
- Demonstration of enzyme activity *in vitro*
- Identification of various biomolecules of tissues by simple colorimetric methods and also quantitative methods
- Identification of different stages of earl embryonic development in animals

**I. ANIMAL PHYSIOLOGY**

1. Qualitative tests for identification of carbohydrates, proteins and fats
2. Study of activity of salivary amylase under optimum conditions
3. T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage
4. Differential count of human blood

**II. CELLULAR METABOLISM**

1. Estimation of total proteins in given solutions by Lowry's method.
2. Estimation of total carbohydrate by Anthrone method.
3. Qualitative tests for identification of ammonia, urea and uric acid
4. Protocol for Isolation of DNA in animal cells

**III. EMBRYOLOGY**

1. Study of T.S. of testis, ovary of a mammal
2. Study of different stages of cleavages (2, 4, 8 cell stages)
3. Construction of fate map of frog blastula

**REFERENCE BOOKS:**

- Harper's Illustrated Biochemistry
- Cell and molecular biology: Concepts & experiments. VI Ed. John Wiley &sons. Inc.
- Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.
- Laboratory techniques by Plummer

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**II B.Sc BZC**  
**ZOOLOGY**  
**SEMESTER IV**

**PAPER– 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**HOURS : 60**

**Max. Marks: 100**

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**Course Outcomes:**

This course will provide students with a deep knowledge in immunology, genetics, embryology and ecology and by the completion of the course the graduate shall able to –

- CO1** To get knowledge of the organs of Immune system, types of immunity, cells and organs of immunity.
- CO2** To describe immunological response as to how it is triggered (antigens) and regulated (antibodies)
- CO3** Understand the applications of Biotechnology in the fields of industry and agriculture including animal cell/tissue culture, stem cell technology and genetic engineering.
- CO4** Get familiar with the tools and techniques of animal biotechnology.

**Learning Objectives**

- To trace the history and development of immunology
- To provide students with a foundation in immunological processes
- To be able to compare and contrast the innate versus adaptive immune systems and humoral versus cell-mediated immune responses
- Understand the significance of the Major Histo compatibility Complex in terms of immune response and transplantation
- To provide knowledge on animal cell and tissue culture and their preservation
- To empower students with latest biotechnology techniques like stem cell technology, genetic engineering, hybridoma technology, transgenic technology and their application in medicine and industry for the benefit of living organisms
  - To explain *in vitro* fertilization, embryo transfer technology and other reproduction manipulation methodologies.
  - To get insight in applications or recombinant DNA technology in agriculture, production of therapeutic proteins.
  - To understand principles of animal culture, media preparation.

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**II B.Sc BZC**  
**ZOOLOGY**  
**SEMESTER IV**

**PAPER– 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**HOURS : 60**

**Max. Marks: 100**

- 
- Unit – I      Immunology – I (Overview of Immune system)**
- 1.1 Introduction to basic concepts in Immunology
  - 1.2 Innate and adaptive immunity, Vaccines and Immunization programme
  - 1.3 Cells of immune system
  - 1.4 Organs of immune system
- Unit – II      Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity)**
- 2.1 Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvants; Factors influencing immunogenicity
  - 2.2 Antibodies: Structure of antibody, Classes and functions of antibodies
  - 2.3 Structure and functions of major histocompatibility complexes
  - 2.4 Exogenous and Endogenous pathways of antigen presentation and processing
  - 2.5 Hypersensitivity – Classification and Types
- Unit – III      Techniques**
- 2.1 Animal Cell, Tissue and Organ culture media: Natural and Synthetic media,
  - 2.2 Cell cultures: Establishment of cell culture (primary culture, secondary culture, types of cell lines; Protocols for Primary Cell Culture); Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures
  - 2.3 Stem cells: Types of stem cells and applications
  - 2.4 Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb)
- Unit – IV      Applications of Animal Biotechnology**
- 3.1 Genetic Engineering: Basic concept, Vectors, Restriction Endonucleases and Recombinant DNA technology
  - 3.2 Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated gene delivery
  - 3.3 Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish; applications
  - 3.4 Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization, super ovulation, Embryo transfer, Embryo cloning
- Unit - V**
- 1.1. PCR: Basics of PCR.
  - 4.2 DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing (2 hrs)
  - 4.3 Hybridization techniques: Southern, Northern and Western blotting
  - 4.4 DNA fingerprinting: Procedure and applications
  - 4.5 Applications in Industry and Agriculture: Fermentation: Different types of Fermentation and Downstream processing; Agriculture: Monoculture in fishes, polyploidy in fishes

### **Co-curricular activities (suggested)**

- Organizing awareness on immunization importance in local village in association with NCC and NSS teams
- Charts on types of cells and organs of immune system
- Student study projects on aspects such as – identification of allergies among students (hypersensitivity), blood groups in the class (antigens and antibodies duly reported) etc., as per the creativity and vision of the lecturer and students
- Visit to research laboratory in any University as part of Zoological tour and exposure and/or hands-on training on animal cell culture.
- Visit to biotechnological laboratory in University or any central/state institutes and create awareness on PCR, DNA finger printing and blot techniques or Visit to a fermentation industry or Visit to a local culture pond and submit report on culture of fishes etc.

### **REFERENCE BOOKS**

1. Immunology by Ivan M. Riott
2. Immunology by Kubey
3. Sreekrishna V. 2005. *Biotechnology –I, Cell Biology and Genetics*. New Age International Publ. New Delhi, India.

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**II B.Sc BZC**  
**ZOOLOGY PRACTICAL SYLLABUS FOR V SEMESTER**  
**SEMESTER IV**

**PAPER– 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**Periods: 24**

**Max. Marks: 50**

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**Learning Objectives:**

- Acquainting student with immunological techniques vis-à-vis theory taught in the class room
- Interconnect the theoretical and practical knowledge of immunity with the outer world for the development of a healthier life.
- Demonstrate basic laboratory skills necessary for Biotechnology research
- Promoting application of the lab techniques for taking up research in higher studies

**I. IMMUNOLOGY**

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination
4. Demonstration of
  - a. ELISA
  - b. Immunoelectrophoresis

**II. Animal biotechnology**

1. DNA quantification using DPA Method.
2. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
3. Separation, Purification of biological compounds by paper, Thin-layer and Column chromatography
4. Cleaning and sterilization of glass and plastic wares for cell culture.
5. Preparation of culture media.

**REFERENCE BOOKS**

1. Immunology Lab Biology 477 Lab Manual; Spring 2016 Dr. Julie Jameson
2. Practical Immunology A Laboratory Manual; **LAP LAMBERT Academic Publishing**
3. Manual of laboratory experiments in cell biology by Edward, G
4. Laboratory Techniques by Plummer

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
II B.Sc BZC  
ZOOLOGY  
SEMESTER IV**

**PAPER– 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**INTERNAL MARKS ALLOTMENT**

**Zoology Theory- Internal**

**Total Marks: 40**

1. Project	:	10 marks
2. Assignments (2)	:	5x2=10 marks
3. Internals (2) Average	:	10 marks
4. Seminar	:	5 marks
5. Viva voce	:	5 marks

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
II B.Sc BZC  
ZOOLOGY  
SEMESTER IV**

**PAPER– 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**EXTERNAL MARKS ALLOTMENT**

**Time: 3 Hours**

**Total Marks: 60**

**Zoology Theory- External**

**Section –A**

I. Short Answer questions 1 to 10 (Any 5 from given 10) 5x4=20

**Section –B**

II. Essay Questions 11 to 15 (With internal choice) 5x8=40

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc (B.Z.C) ZOOLOGY**

**SEMESTER IV**

**PAPER– 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**  
**PRACTICAL MARKS ALLOTMENT**

**Zoology Practical's - External**

**Time: 3 hrs.**

**Total Marks: 25**

- |   |   |                   |
|---|---|-------------------|
| 1. Major dissection demonstration only        | : | 8 marks           |
| (Identification-2M; Diagram-3M; Labelling-3M) |   |                   |
| 2. Mounting (2)/Minor dissection (1)          | : | 4 marks (2+2)     |
| 3. Identification (2)                         | : | 5 marks (2x2 1/2) |
| 4. Record                                     | : | 5 marks           |
| 5. Viva voce                                  | : | 3 marks           |

**Zoology Practical's – Internal**

**Total Marks: 25**

- |                                   |   |         |
|-----------------------------------|---|---------|
| 1. Assessment including viva voce | : | 6 marks |
| 2. Record                         | : | 6 marks |
| 3. Field note book                | : | 5 marks |
| 4. Project                        | : | 8 marks |

**Question Paper Blue Print**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc BZC  
ZOOLOGY  
SEMESTER IV**

**PAPER– 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A: Short Questions : 5 x 4 = 20**

Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

**Section-B: Essay Questions : 5 x 8 = 40**

Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

**Total : 60 Marks**

**Model Question Paper**

**Course code:**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**II B.Sc BZC**

**ZOOLOGY**

**SEMESTER IV**

**PAPER- 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**Time: 3Hrs**

**Max Marks: 60**

**SECTION-A**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x4=20**

1. Epitopes
2. IgM structure
3. Functions of major histocompatibility complex
4. Types of cell lines
5. Applications of monoclonal antibodies
6. Superovulation
7. In vitro fertilization
8. Western blotting technique
9. Monoculture in fishes
10. Cryopreservation

**SECTION-B**

**II. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x8=40**

**11.a. Describe in detail about innate immunity**

**OR**

**b. What are Lymphoid organs explain the importance of primary lymphoid organs**

**12.a. Explain the different of antigens**

**OR**

**b. Describe the structure and functions of major histocompatibility complex**

**13.a. Describe the different types of stem cells and its applications**

**OR**

**b. Write about the production and application of monoclonal antibodies**

**14.a. What do you understand by IVF in vitro fertilization? Explain the process.**

**OR**

**b. Give a detailed account on Recombinant DNA technology**

**15.a. Explain the DNA fingerprinting process and its applications**

**OR**

**b. Write about the steps involved in downstream process of fertilization**

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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**DEPARTMENT OF ZOOLOGY**  
**SKILL DEVELOPMENT COURSES**  
**ZOOLOGY STREAM**

Syllabus of  
**POULTRY FARMING**

Total 30 hrs (02h/wk), 02 Credits & Max 50 Marks

**Learning Outcomes:**

By successful completion of the course, students will be able to;

1. Understand the field level structure and functioning of insurance sector and its role in protecting the risks
2. Comprehend pertaining skills and their application for promoting insurance coverage
3. Prepare better for the Insurance Agent examination conducted by IRDA
4. Plan 'promoting insurance coverage practice' as one of the career options.

**SYLLABUS:**

**Section I (Introduction to Poultry Farming): 10Hrs**

- 1.1 General introduction to poultry farming -Definition of Poultry; Past and present scenario ofpoultry industry in India.
- 1.2 Principles of poultry housing. Poultry houses. Systems of poultry farming.
- 1.3 Management of chicks, growers and layers. Management of Broilers.
- 1.4 Preparation of project report for banking and insurance

**Section II (Feed and Livestock Health Management): 10 Hrs**

- 2.1 Poultry feed management – Principles of feeding, Nutrient requirements for different stagesoflayers and broilers. Feed formulation and Methods of feeding.
- 2.2 Poultry diseases – viral, bacterial, fungal and parasitic(two each); symptoms, control andmanagement; Vaccination programme.

**Section III(Harvesting of Eggs and Sanitation): 10 Hrs**

- 3.1 Selection, care and handling of hatching eggs. Egg testing.Methods of hatching.
- 3.2 Brooding andrearing. Sexing of chicks.
- 3.3 Farm and Water Hygiene, Recycling of poultry waste.

**Co-curricular Activities Suggested: (4 hrs)**

1. Group discussion & SWOT analysis
2. Visit to a poultry farm
3. Invited Lectures by Concerned officers of government or private farms
4. Cheap and Healthy Feed preparation by students based on government standards
5. Market study and Survey (Monitoring of daily price hike in poultry market and analysis)
6. Online SwayamMoocs course on poultry farming (see reference 9 below)

**Reference books:**

1. Sreenivasaiah., P. V., 2015. Textbook of Poultry Science. 1st Edition. Write & Print Publications, New Delhi
2. Jull A. Morley, 2007. Successful Poultry Management. 2nd Edition. Biotech Books, New Delhi"
3. Hurd M. Louis, 2003. Modern Poultry Farming. 1st Edition. International Book Distributing Company, Lucknow."
4. Life and General Insurance Management, "
5. Financial services, Tata McGraw hill
6. <http://www.asci-india.com/BooksPDF/Small%20Poultry%20Farmer.pdf>
7. [https://nsdcindia.org/sites/default/files/MC\\_AGR-Q4306\\_Small-poultry-farmer-.pdf](https://nsdcindia.org/sites/default/files/MC_AGR-Q4306_Small-poultry-farmer-.pdf)
8. <http://ecoursesonline.iasri.res.in/course/view.php?id=335>
9. [https://swayam.gov.in/nd2\\_nou19\\_ag09/preview](https://swayam.gov.in/nd2_nou19_ag09/preview)

**Model Question paper**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
DEPARTMENT OF ZOOLOGY  
SKILL DEVELOPMENT COURSES  
ZOOLOGY STREAM  
POULTRY FARMING  
QUESTION BANK**

Total 30 hrs (02h/wk), 02 Credits & Max 50 Marks

**I. Answer any Five of the following questions.**

**5x10= 50M**

1. Discuss briefly the present and future scenario of poultry farming industry in India.
2. Explain the principles of poultry housing in detail with examples.
3. Write an essay on management of chicks.
4. Write an essay on management of Broilers.
5. Write an essay on Viral and Bacterial diseases in poultry ( Two each).
6. Discuss any two fungal and Parasitic diseases.
7. Explain the nutritional requirements for layers.
8. Write an essay on selection, care, handling and hatching of eggs.
9. Explain sexing of chicks.
10. Explain various methods of hatching in poultry.

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**DEPARTMENT OF ZOOLOGY**  
**SKILL DEVELOPMENT COURSES**  
**ZOOLOGY STREAM**  
**POULTRY FARMING**  
**QUESTION BANK**

Total 30 hrs (02h/wk), 02 Credits & Max 50 Marks

**Essay questions**

1. Discuss briefly the present and future scenario of poultry farming industry in India.
2. Explain the principles of poultry housing in detail with examples.
3. Write an essay on management of chicks.
4. Write an essay on management of Broilers.
5. Write an essay on Bacterial diseases in poultry .
6. Write an essay on management of Layers.
7. Write an essay on Viral diseases in poultry.
8. Write an essay on fungal diseases in poultry.
9. Write an essay on Parasitic diseases in poultry.
10. Explain nutritional requirement for layers.
11. Explain nutritional requirement for Broilers.
12. Write an essay on selection, care and handling of hatchery of eggs.
13. Explain various methods of hatching in poultry.
14. Explain recycling of poultry waste.
15. Explain sexing of chicks.
16. Write an essay on selection, care handling and hatching of eggs.

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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**ZOOLOGY SYLLABUS**

**SEMESTER-V**

**PAPER – V**

**ANIMAL BIOTECHNOLOGY**

**Periods: 60**

**Max. Marks: 100**

**Unit 1: Tools of Recombinant DNA technology - Enzymes and Vectors**

**Restriction modification systems:** Types I, II and III. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering

**DNA modifying enzymes and their applications:** DNA polymerases. Terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases

**Cloning Vectors:** Plasmid vectors:pBR and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs,

**Unit 2 Techniques of Recombinant DNA technology**

**Cloning:** Use of linkers and adaptors

**Gene delivery:** Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated delivery

**PCR:** Basics of PCR.

**DNA Sequencing:** Sanger's method of DNA sequencing- traditional and automated sequencing

**Hybridization techniques:** Southern, Northern and Western blotting,

**Genomic and cDNA libraries:** Preparation and uses

**UNIT 3 Animal Cell Technology**

**Cell culture media:** Natural and Synthetic

**Cell cultures:** primary culture, secondary culture, continuous cell lines; Protocols for Primary Cell Culture; Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures.

**Hybridoma Technology:** Cell fusion, Production of Monoclonal antibodies (mAb), Applications of mAb

**Stem cells:** Types of stem cells, applications

**Unit 4 Reproductive Technologies & Transgenic Animals**

**Manipulation of reproduction in animals:** Artificial Insemination, *In vitro* fertilization , super ovulation, Embryo transfer, Embryo cloning

**Transgenic Animals:** Strategies of Gene transfer; Transgenic - sheep, - fish; applications

**Unit 5 Applied Biotechnology**

**Industry:** Fermentation: Different types of Fermentation: Short notes on - Submerged & Solid state; batch, Fed batch & Continuous; Stirred tank, Air Lift, Fixed Bed and Fluidized; Downstream processing - Filtration, centrifugation, extraction, chromatography, spray drying and lyophilization

**Agriculture:** fisheries – monoculture in fishes, polyploidy in fishes; DNA fingerprinting

**Additional Input: Prebiotics and Probiotics**

III B.Sc BZC  
ZOOLOGY PRACTICAL SYLLABUS  
SEMESTER-V  
PAPER – V  
ANIMAL BIOTECHNOLOGY

Periods: 24

Max. Marks: 50

Any SIX of the following:

1. Maintenance and storage of *E.coli* DH5 alpha cells.
2. Isolation of Plasmid DNA from *E.coli*
3. Preparation of genomic DNA from *E. coli*/animals/ human.
4. DNA quantification using agarose gel electrophoresis (by using lambda DNA as standard).
5. Restriction digestion of lambda ( $\lambda$ ) DNA using EcoR1 and Hind III.
6. Preparation for insertion and vector for ligation.
7. Performance of ligation reaction using T4 DNA ligase.
8. Preparation of competent cells
9. Transformation of *E. coli* with plasmid DNA using CaCl<sub>2</sub>,
10. Selection of transformants on X-gal and IPTG
11. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
12. Interpretation of sequencing gel electropherograms
13. Amplification of DNA by PCR
14. Packing and sterilization of glass and plastic wares for cell culture.
15. Preparation of culture media.

REFERENCE BOOKS

1. Brown TA. (2010). Gene Cloning and DNA Analysis. 6th edition. Blackwell Publishing, Oxford, U.K.
2. Clark DP and Pazdernik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA
3. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.
4. Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press
5. Wiley JM, Sherwood LM and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education
6. Brown TA. (2007). Genomes-3. Garland Science Publishers
7. Primrose SB and Twyman RM. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.
8. Animal Cells Culture and Media, D.C. Darling and S.J. Morgan, 1994. BIOS Scientific Publishers Limited.
9. Methods in Cell Biology, Volume 57, Jennie P. Mathur and David Barnes, 1998. Animal Cell Culture Methods Academic Press.
10. P.K. Gupta: Biotechnology and Genomics, Rastogi publishers (2003).
11. B.D. Singh: Biotechnology, Kalyani publishers, 1998 (Reprint 2001)

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC  
ZOOLOGY THEORY**

**INTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER- V**

**ANIMAL BIOTECHNOLOGY**

**Zoology Theory- Internal**

**Total Marks: 40**

1. Internals (2)	:	10 marks
2. Assignments (2)	:	5x2=10 marks
3. Project	:	10 marks
4. Seminar	:	5 marks
5. Attendance	:	5 marks

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC  
ZOOLOGY THEORY**

**EXTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – V**

**ANIMAL BIOTECHNOLOGY**

**Zoology Theory- External**

**Total Marks: 60**

**Section –A**

I. Short Answer questions (Any 5 from given 10) 1 to 10		5x4=20
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**Section –B**

II. Essay Questions (With internal choice) 11 to 15		5x8=40
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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**ZOOLOGY**

**PRACTICAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – V**

**ANIMAL BIOTECHNOLOGY**

**Zoology Practical's - External**

**Time: 3 hrs.**

**Total Marks: 25**

1. Major experiment	:	8 marks
2. Minor experiment	:	6 marks
3. Identification	:	6 marks
4. Viva voce	:	5 marks

**Zoology Practical's - Internal**

**Total Marks: 25**

1. Assessment	:	10 marks
2. Record	:	10 marks
3. Field note book	:	5 marks

**Question Paper Blue Print**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC  
ZOOLOGY THEORY**

**SEMESTER-V**

**PAPER – V**

**ANIMAL BIOTECHNOLOGY**

**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

**Total : 60 Marks**

**Model Question Paper**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**ZOOLOGY**

**SEMESTER-V**

**PAPER – V**

**ANIMAL BIOTECHNOLOGY**

**Time: 2½hrs**

**Max Marks: 60**

**SECTION-A**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x4=20**

1. DNA polymerases. DNA పాలిమరేజస్
2. Cosmids కస్మిడ్ డిస్కస్
3. Electrophoration. ఎలక్ట్రోఫోరేషన్
4. PCR పాలిమరేజ్ చైన్ రియాక్షన్
5. Organ culture. అంగవన ము
6. Cryopreservation క్రియోప్రజర్వేషన్
7. Super ovulation. సూపర్-ఓవరీ అసిండ్రియేషన్ రిము
8. Embryo Cloning ఎంబ్రియో క్లినింగ్
9. Centrifugation సెంట్రీఫ్యూజింగ్ గేషన్
10. DNA finger printing. DNA ఫింగర్ ప్రింటింగ్

**SECTION-B**

**II. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x8=40**

11. (a) Explain different types of restriction enzymes used in genetic engineering.

జన్యు అనండు ఉపయోగపడు వరివిధ రిక్టరికల్ ఎంజైమ్స్ మును  
సంకలితకణాల్లో వనివరించుండు.  
ము Or

(b) Write an essay on cloning vectors.

రింజింజి ఒక వ్యయిర్ సర్జింజి రాయంజి.  
వనికలి  
రంజి


12. (a) Explain the preparation of genomic and c-DNA libraries.

జననిమిక్ టైపరరీ మరని ంజి-డని ఎనక్వ టైపరరీ తనియరీ  
వనిధనమనివివరించుంజి

Or

(b) Write an essay on Sanger's methods of DNA sequencing.

సర్జింగ్ వనిధనం దివని ర DNA సర్జిని రింజి రింజి  
తనియరీగవనించు పదిధతనిం గరిరని ఒక  
వ్యయిర్ సర్జిం రాయంజి.



13.(a) Give an account on production of MAb's and it's applications.

MAb యొక్క ఉత్పత్తి మరియు ఉపయోగాలు



వివరించండి

Or

(b) Describe the different types of Stemcells and it's applications.

వివిధ రకాలైన మూలకణాలను మరియు వాటి  
ఉపయోగాలు వివరించండి

14. (a) What do you understand by (IVF) Invitro Fertilization. How it is done?

IVF అనగానీమి ? IVF జరుగు పదీతిం వివరింపుము?

Or

(b) What is transgenesis and explain it's application in animals?

నీనీ జనీనీనీనీనీ అనీనీనీనీనీనీ ఏమీనీ? నీనీ వలనకలనీగు

నీనీనీనీనీనీనీనీనీనీనీనీనీనీనీనీనీనీనీ

15. (a) Explain the steps involved in down stream processing of fermentation.

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Or

(b) Explain monoculture and polypoidy in fishes.

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**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**ZOOLOGY SYLLABUS**

**SEMESTER-V**

**PAPER – VI**

**ANIMALHUSBANDRY**

**Periods:60**

**Max. Marks: 100**

**UNIT – I :**

General introduction to poultry farming. Principles of poultry housing. Poultry houses. Systems of poultry farming. Management of chicks, growers and layers. Management of Broilers.

**UNIT – II:**

Poultry feed management – Principles of feeding. Nutrient requirements for different stages of layers and broilers. Methods of feeding. Poultry diseases – viral, bacterial, fungal and parasitic (two each); symptoms, control and management.

**UNIT – III:**

Selection, care and handling of hatching eggs. Egg testing. Methods of hatching. Brooding and rearing. Sexing of chicks.

**UNIT- IV:**

Breeds of Dairy Cattle and Buffaloes – Definition of breed; Classification of Indian Cattle breeds, exotic breeds and Indian buffalo breeds. Systems of inbreeding and crossbreeding. Housing of dairy animals – Selection of site for dairy farm; systems of housing – loose, housing system. Conventional dairy barn. Cleaning and sanitation of dairy farm. Weaning of calf. Castration and dehorning. Deworming and Vaccination programme. Records to be maintained in a dairy farm.

**UNIT - V:**

Care and management of dairy animals - Care and management of calf, heifer, milk animal, dry and pregnant animal, bulls and bullocks.

**Additional input : Piggery**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc BZC**  
**ZOOLOGY PRACTICAL SYLLABUS**  
**SEMESTER-V**  
**PAPER – VI**  
**ANIMAL HUSBANDRY**

**Periods: 24**

**Max. Marks: 50**

1. Study of various breeds of layers and broilers (photographs)
2. Identification of disease causing organisms in poultry birds (as per theory)
3. Study of the anatomy of a poultry bird by way of dissecting a bird. (Demonstration)
4. Study of various activities in a poultry farm (layers and broilers) and submission of a report.
5. Study of various breeds of cattle (photographs/microfilms)
6. Study of various activities carried out in a dairy farm and submission of a report.

**REFERENCE BOOKS**

1. TEXTBOOK OF ANIMAL HUSBANDRY by BANERJEE, G.C. Publisher oxford
2. Book on Animal Husbandry Gyan Deep Singh Publisher : Anmol Publishers
3. Paadiparisrama Ch. Ramesh Saritha Veterinary book publishers-Hyderabad, Vijayawada
4. Pasugana yagamanyam Dr. A. Venkata, Ramaiah Rithu nestham Publications
5. Animal Husbandry by Venkateswara Publications, Guntur
6. Kollaprisrama-Telugu Academy.

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc  
ZOOLOGY THEORY**

**INTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – VI**

**ANIMAL HUSBANDRY**

**Zoology Theory- Internal**

**Total Marks: 40**

1. Internals (2)	:	10 marks
2. Assignments (2)	:	5x2=10 marks
3. Project	:	10 marks
4. Seminar	:	5 marks
5. Attendance	:	5 marks

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC & .  
ZOOLOGY THEORY**

**EXTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – VI**

**ANIMAL HUSBANDRY**

**Zoology Theory- External**

**Total Marks: 60**

**Section –A**

I. Short Answer questions (Any 5 from given 10) 1 to 10		5x4=20
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**Section –B**

II. Essay Questions (With internal choice) 11 to 15		5x8=40
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**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC  
ZOOLOGY**

**PRACTICAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – VI**

**ANIMAL HUSBANDRY**

**Zoology Practical's - External**

**Time: 3 hrs.**

**Total Marks : 25**

1. Major	:	8 marks
2. Minor	:	6 marks
3. Identification	:	6 marks
4. Viva voce	:	5 marks

**Zoology Practical's - Internal**

**Total Marks: 25**

1. Assessment	:	10 marks
2. Record	:	10 marks
3. Field note book	:	5 marks

**Question Paper Blue Print**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC  
ZOOLOGY THEORY**

**SEMESTER-V**

**PAPER – VI**

**ANIMAL HUSBANDRY**

**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

**Total : 60 Marks**

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
III B.Sc BZC  
SEMESTER-V  
PAPER – VI  
ANIMAL HUSBANDRY

Time: 3hrs

Max Marks: 60

**SECTION-A**

I. Answer any FIVE of the following  
Draw labeled diagram wherever necessary

5x4=20

1. Deep litter system దీపి లిటర్ వస్తి వస్తి
2. Management of layers గొడుమిట్టా రళ్ళిల యజమనీ పదత్రులు
3. Poultry Feed management రళ్ళిల డి యజమనీ
4. Marek's disease మారెకీ వ్యాధి
5. Candle test కండ్లి తీత పరీక్ష
6. Methods of Hatching హాచింగ్ పదత్రులు
7. Cleaning and Sanitation of Dairy Farms పాలశాల పరిశుభ్రత మరియు శుభ్రత
8. Vaccination programme టీకా కార్యక్రమం
9. Care and management of milk animals పాలనిచ్చి పశువుల మరియు శిశిర హాణ్ సర్కంరణ్
10. Care and Management of Bulls and Bullocks రథాలు మరియు దుని హాతం మరియు శిశిర హాణ్

**SECTION-B**

II. Answer any FIVE of the following  
Draw labeled diagram wherever necessary

5x8=40

11. a. Explain the different types of sheds in Poultry  
పౌల్టరీలో వివిధ వివరించండి  
రకలు

షెడలు

(or)

b. Describe different methods of management of chicks

రథిలలో శిశిర హాణ్ యొక్క వివిధ పదత్రులు మరియు వివరించండి

12. a. Describe Nutrient requirement for Layers and Broilers  
షిలర్లలో మరియు లేయర్లలో యొక్క పోషక అవసరాలను వివరించండి

(or)

b. Write an essay on symptoms, control and management of any two viral and two bacterial diseases.

రళ్ళిల లో వచ్చే రెండు వైరల్ మరియు రెండు బాక్టీరియా వ్యాధిల లక్షణాలు, నియంత్రణ మరియు నిర్వహణ పై ఒక వ్యాధి సర్కిం రాయండి

13 a. Write an essay on different methods of hatching of eggs

గొడుమిట్టా పోడింగ్ లో వివిధ పద్ధతులు

వివిధ పద్ధతులు

(or)

b. Write an essay on sexing of chicks

రడకిలలలో లింగింగింరాధ రిణ్ పది ధతకిల పె వయిR సరిం  
రాయిండి



**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC & ATZC**

**SEMESTER-VI**

**ZOOLOGY –SUBJECT ELECTIVE**

**PAPER – VII-A**

**IMMUNOLOGY**

**Periods: 60**

**Max. Marks: 100**

**Unit - I**

**Overview of Immune system**

Introduction to basic concepts in Immunology

Innate and adaptive immunity

**Cells and organs of Immune system**

Cells of immune system

Organs of immune system

**Unit - II**

**Antigens**

Basic properties of antigens

B and T cell epitopes, haptens and adjuvants

Factors influencing immunogenicity

**Unit - III**

**Antibodies**

Structure of antibody

Classes and functions of antibodies

Monoclonal antibodies

**Unit - IV**

**Working of Immune system**

Structure and functions of major histocompatibility complexes

Exogenous and Endogenous pathways of antigen presentation and processing

Basic properties and functions of cytokines

**Unit - V**

**Immune system in health and disease**

Classification and brief description of various types of hyper sensitivities

Introduction to concepts of autoimmunity and immunodeficiency

**Vaccines**

General introduction to vaccines

Types of vaccines

\* **ADDITIONAL INPUT:** Transplantation Immunology

**Reference Books:**

1. Richard A. Glodsky, Thomas J Kind, Barbara A. Osborne, Janis Kuby, Immunology, 5th ed, Freeman and Co. New York
2. Ivan Roitt, Immunology, 4th ed, Johanthan Brostoff, Mosby, London.
3. Kindt, T. J., Goldsby, R. A., Osborne, B. A., Kuby, J. (2006). VI Edition. Immunology. W.H. Freeman and Company.
4. Delves, P. J., Martin, S. J., Burton, D. R., Roitt, I.M. (2006). XI Edition. Roitt's Essential Immunology, Blackwell Publishing. \*

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc BZC & ATZC**  
**ZOOLOGY PRACTICAL SYLLABUS**  
**SEMESTER-VI**  
**PAPER – VII-A**  
**IMMUNOLOGY**

**Periods: 24**

**Max. Marks: 50**

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination
4. Demonstration of
  - a. ELISA
  - b. Immunoelectrophoresis

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc BZC & ATZC**  
**SEMESTER-VI**  
**ZOOLOGY- SUBJECT ELECTIVE**  
**PAPER – VII-A**  
**IMMUNOLOGY**

**INTERNAL MARKS ALLOTMENT**

**Zoology Theory- Internal**

**Total Marks: 40**

1. Internals (2) marks	:	10
2. Assignments (2) marks	:	5x2=10
3. Project marks	:	10
4. Seminar marks	:	5
5. Attendance	:	5 marks

**EXTERNAL MARKS ALLOTMENT**

**Zoology Theory- External**

**Total Marks: 60**

**Section –A**

III. Short Answer questions (Any 5 from given 10) 1 to 10	5x4=20
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**Section –B**

IV. Essay Questions (With internal choice) 11 to 15	5x8=40
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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc BZC & ATZC**  
**SEMESTER-VI**  
**ZOOLOGY –ELECTIVE - PAPER – VII-A**  
**IMMUNOLOGY**

**PRACTICAL MARKS ALLOTMENT**

**Zoology Practical's - External**

**Time: 3 hrs.**

**Total Marks: 25**

1. Major experiment	:	8 marks
2. Minor experiment	:	6 marks
3. Identification	:	6 marks
4. Viva voce	:	5 marks

**Zoology Practical's - Internal**

**Total Marks: 25**

1. Assessment	:	10 marks
2. Record	:	10 marks
3. Field note book	:	5 marks

**Question Paper Blue Print**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC & ATZC**

**SEMESTER-VI**

**ZOOLOGY-SUBJECT ELECTIVE**

**PAPER – VII-A**

**IMMUNOLOGY**

**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

3. Short Questions : 5 x 4 = 20

4. Essay Questions : 5 x 8 = 40

**Total : 60 Marks**

Model Question Paper

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc BZC & ATZC

SEMESTER-VI

ZOOLOGY-SUBJECT ELECTIVE

PAPER – VII-A

IMMUNOLOGY

Time: 3 hrs

Max Marks: 60

SECTION-A

III. Answer any FIVE of the following

Draw labeled diagram wherever necessary

5x4=20

1. Phagocytosis రక్తశుక్రకరియ
2. Passive Immunity ఆరణ్యత  
అసక్తికరమైన టి  
రింటుట్ట
3. Haptens and adjuvants హిప్టెన్లు మరియు  
అదృశ్యం
4. Interferon's ఇంటిఫెరన్ పిరన్య
5. Ig G structure. ఐ.జి.జి రింగ్రాఫి ణం
6. Applications of M.C.A యిం.నమ్.ఎ. అన్యవరణితు
7. Functions of MHC ఎమి. హెచ్.ఎస్.ఎం.  
విషయవిజ్ఞానాలు
8. Action of cytokines. సక్రి. ట్రోఫిక్ సక్రి విషయం 'రిం
9. Delayed hypersensitivity కణమ ధూ వరితిత్తి  
అధిసక్తికరణి
10. RRACoombs ఆర్.ఆర్. ఎ. కూబ్స్

SECTION-B

IV. Answer any FIVE of the following

Draw labeled diagram wherever necessary

5x8=40

11. (a) What is the difference between Innate and Adaptive immunity.



పాఠశాల పాఠ్యపుస్తకం ధృవీకరించిన అవధివ్యయలు గుర్తించిన తెలపండి

12. (a) Explain types of antigens

వివేచన రీతిలో ప్రతిజనకలు గుర్తించే తలపండి

(OR)

(b) What are the properties of T-cell Epitopes

సీ-కణాల ఎపిటోపిస్ ధరాసీ లు గుర్తించే వివేచన

13. (a) Explain the structure of an typical antigen

సాధారణ యాంటిజెన్ యొక్క సీరిందాసీ జీరిందీ

వీవరణించండి

(OR)

(b) What are the functions of Immunoglobulin's-Explain?

ఇమ్యూనిగ్లూబిన్ల ఫంక్షన్లు గుర్తించే తలపండి

14. (a) Explain Endogene Pathway of antigen

ప్రతిరోక్షక వేండ్రిజన్ వేధనం గుర్తించే తలపండి

(OR)

(b) What are the functions of Cytokines-Explain?

సైటోకైన్ల ఫంక్షన్లు గుర్తించే తలపండి

15. (a) Explain types of hyper sensitivities

వీవధ రీతిలో అతీ సెన్సిటివిటీ గ్రహణ తీ గుర్తించే తలపండి

(OR)

(b) Explain types of Vaccines.

వీవధ రీతిలో వేయిస్ ధీరింద్రక టీకాల గుర్తించే తలపండి

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**ZOOLOGY SYLLABUS FOR CLUSTER ELECTIVE –VIII-B:  
SEMESTER-VI  
AQUACULTURE**

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc BZC

SEMESTER-VI

**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-1  
PRINCIPLES OF AQUACULTURE**

**Periods:60**

**Max.Marks:100**

**Unit – I**

**1.1 Introduction / Basics of Aquaculture**

- 1.1.1 Definition, Significance and History of Aquaculture
- 1.1.2 Present status of Aquaculture – Global and National scenario
- 1.1.3 Major cultivable species for aquaculture: freshwater, brackish water and marine.
- 1.1.4 Criteria for the selection of species for culture

**Unit – II**

**2.1 Types of Aquaculture**

- 2.1.1 Freshwater, Brackishwater and Marine
- 2.1.2 Concept of Monoculture, Polyculture, Composite culture, Monosex culture and Integrated fish farming

**2.2 Culture systems**

- 2.2.1 Ponds, Raceways, Cages, Pens, Rafts and water recirculating systems

**2.3 Culture practices**

- 2.3.1 Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.

**ADDITIONAL INPUT: SONAR Navigation system**

**Unit – III**

**3.1 Design and construction of aquafarms**

- 3.1.1 Criteria for the selection of site for freshwater and brackish water pond farms
- 3.1.2 Design and construction of fish and shrimp farms

**3.2 Seed resources**

- 3.2.1 Natural seed resources and Procurement of seed for stocking: Carp and shrimp

**3.3 Nutrition and feeds**

- 3.3.1 Nutritional requirements of a cultivable fish and shellfish
- 3.3.2 Natural food and Artificial feeds and their importance in fish and shrimp culture

**Unit – IV**

**4.1 Management of carp culture ponds**

- 4.1.1 Culture of Indian major carps: Pre-stocking management – Dewatering, drying, ploughing/desilting; Predators, weeds and algal blooms and their control, Liming and fertilization; Stocking management – Stocking density and stocking; Post-stocking management – Feeding, water quality, growth and health care; and Harvesting of ponds

**4.2 Culture of giant freshwater prawn, *Macrobrachium rosenbergii***

**Unit – V**

**5.1 Culture of shrimp (*Penaeus monodon* or *Litopenaeus vannamei*)**

**5.2 Culture of pearl oysters**

**5.3 Culture of seaweeds-species cultured, culture techniques, important by-products, prospects**

**5.4 Culture of ornamental fishes – Setting up and maintenance of aquarium; and breeding.**

**Periods : 24**

**Max.Marks : 50**

**Cultivable fishes**

1. Identification and study of important cultivable and edible fishes - Any ten
2. Identification and study of important cultivable and edible crustaceans - Any five
3. Identification and study of common aquarium fishes – Any five
4. General description and recording biometric data of a given fish.

**Diseases**

1. Identification and study of fish and shrimp diseases - Using specimens / pictures
2. External examination of the diseased fish – diagnostic features and procedure.
3. Autopsy of fish – Examination of the internal organs.
4. Determination of dosages of chemicals and drugs for treating common diseases.

**Pond Management**

1. Water Quality -Determination of temperature, pH, salinity in the pond water sample; Estimation of dissolved oxygen, free carbondioxide, total alkalinity, total hardness, phosphates and nitrites.
2. Soil analysis – Determination of soil texture, pH, conductivity, available nitrogen, available phosphorus and organic carbon.
3. Identification and study of common zooplankton, aquatic insects and aquatic weeds – Each 5

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1. Bardach, JE *et al.* 1972. *Aquaculture – The farming and husbandry of freshwater and marine organisms*, John Wiley & Sons, New York.
2. Bose AN *et al.* 1991. *Coastal aquaculture Engineering*. Oxford & IBH Publ.Co.Pvt.Ltd.
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4. FAO. 2007. *Manual on Freshwater Prawn Farming*.
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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**SEMESTER-VI**

**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-1**

**PRINCIPLES OF AQUACULTURE**

**INTERNAL MARKS ALLOTMENT**

**Zoology Theory- Internal**

**Total Marks: 40**

1. Internals (2)	:	10 marks
2. Assignments (2)	:	5x2=10 marks
3. Project	:	10 marks
4. Seminar	:	5 marks
5. Attendance	:	5 marks

**EXTERNAL MARKS ALLOTMENT**

**Zoology Theory- External**

**Total**

**Marks: 60**

**Section –A**

I.	Short Answer questions (Any 5 from given 10) 1 to 10	5x4=20
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**Section –B**

II.	Essay Questions (With internal choice) 11 to 15	5x8=40
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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**SEMESTER-VI**

**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-1**

**PRINCIPLES OF AQUACULTURE**

**PRACTICAL MARKS ALLOTMENT**

**Zoology Practical's - External**

**Time: 3 hrs.**

**Total Marks: 25**

1. Major experiment	:	8 marks
2. Minor experiment	:	6 marks
3. Identification	:	6 marks
4. Viva voce	:	5 marks

**Zoology Practical's - Internal**

**Total Marks: 25**

1. Assessment	:	10 marks
2. Record	:	10 marks
3. Field note book	:	5 marks

**Question Paper Blue Print**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**SEMESTER-VI**

**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-1**

**PRINCIPLES OF AQUACULTURE**

**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

I. Short Questions : 5 x 4 = 20

II. Essay Questions : 5 x 8 = 40

**Total : 60 Marks**

**Model Question Paper**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**SEMESTER-VI**

**ZOOLOGY –CLUSTER ELECTIVE**

**PAPER – VIII-B-1**

**PRINCIPLES OF AQUACULTURE**

**Time: 2½ hrs**

**Max Marks: 60**

**SECTION-A**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x4=20M**

1. Characters to be present in cultivable fishes పరిపాలనకు అనుకూలమైన లక్షణాలు
2. Brackish water fishes ఉప్పు నీటి చేపలు
3. Monoculture మోనోకల్చర్
4. Intensive fish culture సాంద్రమత్త చేపల పరిపాలన
5. Natural seed resources of fish చేపల విత్తన ల యొక్క స్థల వనరులు
6. Criteria for selection of site for Brackish water pond ఉప్పు నీటి చేపల పరిపాలనకు అనుకూలమైన స్థలం
7. Algal blooms ఆలగల్ బ్లూమ్స్
8. Liming సునూరి చొక్కెం
9. Economic importance of seaweeds సముద్రమత్తల ఆర్థిక ముఖ్యత ల యొక్క ఆర్థిక ముఖ్యత
10. Artificial pearl culture కృత్రిమ ముత్యం పరిపాలన

**SECTION-B**

**II. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x8=40M**

11. (a) Define Aquaculture. Explain the significance and History of Aquaculture

ఆకలి కలిగి రక్షణ పొందేటట్లు చేపల పరిపాలన. ఆకలి కలిగి యొక్క  
ముఖ్యత

మరలీ యే చర్యలు వాటివారినించండి

Or

(b) Explain major cultivable species of freshwater fishes

పరిపాలనకు అనుకూలమైన రక్షణ చేపల వాటివారినించండి

12. (a) Write an essay on Integrated fish culture

సమగ్రమ చేపల పరిపాలన పై ఒక వ్యాసం వ్రాయండి

Or

(b) Explain pen culture and cage culture

పెన్ పింపకము మరియు కేజీ పింపకములను వివరించండి

13. (a) Write an essay on design and construction of fish farm

చరిపల చరిరికివకిల రరిపకలప న మరరి చురిరింరఱరి ణ్రింపై ఒక వ్యరి సరిరిం  
వ్యరియరిండి

Or

(b) Explain the natural food and artificial feeds and their importance in fish culture

చరిపల పిరింపక చరిరికివకిలలో అరిందిరించ రడిరి సరిహజ మరరి చు  
కరి్రితిమ ఆహరాలు మరరి చు ణ్రి పమంభరి తన య  
వరివరిరించరిండి

14. (a) Write an essay on pre stocking management of major carps

పధన కరిప ల యొకక సరిరి క్రిరింరి రిరింరిరి  
హణ్ పై ఒక వ్యరి సరిరిం వ్యరియరిండి

Or

(b) Write an essay on culture of Macrobrachium rosenbergi

మాపరిరరచయరిం రరిసన్నరిబరిరి పిరింపకము పై ఒక వ్యరి సరిరిం వ్యరియరిండి

15. (a) Explain the culture of seaweeds

సరిమండ్రి కలుపకి మరికక ల యొకక వరింపకము పై ఒక వ్యరి సరిరిం  
వ్యరియరిండి

Or

(b) Write an essay on ornamental fish culture

ఆకిరి రరియరిం చరిపల పిరింపకము పై ఒక వ్యరి సరిరిం వ్యరియరిండి

**III B.Sc BZC**  
**SEMESTER-VI**  
**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-2**  
**AQUACULTURE MANAGEMENT**

**Periods : 60**

**Max.Marks : 100**

**Unit – I**

**1.1 Breeding and Hatchery Management**

- 1.1.1 Bundh Breeding and Induced breeding of carp by Hypophysation; and use of synthetic hormones
- 1.1.2 Types of fish hatcheries; Hatchery management of Indian major carps
- 1.1.3 Breeding and Hatchery management of *Penaeus monodon*/ *Litopenaeus vannamei*
- 1.1.4 Breeding and Hatchery management of giant freshwater prawn.

**Unit – II**

**2.1 Water quality Management**

- 2.1.1 Water quality and soil characteristics suitable for fish and shrimp culture
- 2.1.2 Identification of oxygen depletion problems and control mechanisms in culture ponds
- 2.1.3 Aeration: Principles of aeration and Emergency aeration
- 2.1.4 Liming materials, Organic manures and Inorganic fertilizers commonly used and their implications in fish ponds

**ADDITIONAL INPUT:** Waste management in aquaculture

**Unit – III**

**3.1 Feed Management**

- 3.1.1 Live Foods and their role in shrimp larval nutrition.
- 3.1.2 Supplementary feeds: Principal foods in artificial diets; Types of feeds; Feed additives and Preservatives; role of probiotics.
- 3.1.3 Feed formulation and manufacturing; Feed storage
- 3.1.4 Feeding strategies: Feeding devices, feeding schedules and ration size; Feed evaluation- feed conversion efficiencies and ratios

**Unit – IV**

**4.1 Disease Management**

- 4.1.1 Principles of disease diagnosis and health management;
- 4.1.2 Prophylaxis, Hygiene and Therapy of fish diseases
- 4.1.3 Specific and non-specific defense systems in fish; Fish immunization and vaccination
- 4.1.4 Etiology, Symptoms, prophylaxis and therapy of common fish diseases in fish ponds
- 4.1.5 Etiology, Symptoms, prophylaxis and therapy of common shrimp diseases in shrimp ponds

**Unit – V**

**5.1 Economics and Marketing**

- 5.1.1 Principles of aquaculture economics – Capital costs, variable costs, cost-benefit analysis
- 5.1.2 Fish marketing methods in India; Basic concepts in demand and price analysis

**5.2 Fisheries Extension**

- 5.1.3 Fisheries Training and Education in India; Role of extension in community development.

**5.3 Fish Genetics**

- 5.1.4 Genetic improvement of fish stocks – Hybridization of fish.
- 5.1.5 Gynogenesis, Androgenesis, Polyploidy, Transgenic fish, Cryopreservation of gametes, Production of monosex and sterile fishes and their significance in aquaculture.

**III B.Sc BZC**  
**SEMESTER-VI**  
**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-2**  
**AQUACULTURE MANAGEMENT**  
**PRACTICALS**

**Periods :24**

**Max.Marks : 50**

**Nutrition**

1. Identification and study of Live food organisms – Any five
2. Formulation and preparation of a balanced fish feed
3. Estimation of Proximate composition of aquaculture feeds – Proteins, carbohydrates, lipids, moisture, ash content.
4. Gut content analysis to study artificial and natural food intake.

**Post harvest Technology**

1. Evaluation of fish/ fishery products for organoleptic, chemical and microbial quality.
2. Preparation of dried, cured and fermented fish products, examination of salt, protein, moisture in dried / cured products, examination of spoilage of dried / cured fish products, marinades, pickles, sauce.
3. Preparation of isinglass, collagen and chitosan from shrimp and crab shell. ?
4. Developing flow charts and exercises in identification of hazards – preparation of hazard analysis worksheet, plan form and corrective action procedures in processing of fish.

**REFERENCE BOOKS**

1. Boyd CE. 1979. *Water Quality in Warm Water Fish Ponds*. Auburn University
2. Boyd, CE. 1982. *Water Quality Management for Pond Fish Culture*. Elsevier Sci. Publ. Co.
3. Chakraborty C & Sadhu AK. 2000. *Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn*. Daya Publ. House
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7. ICAR. 2006. *Handbook of Fisheries and Aquaculture*. ICAR.
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21. Singh B. 2006. *Marine Biotechnology and Aquaculture Development*. Daya Publ. House
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23. Swain P, Sahoo PK & Ayyappan S. 2005. *Fish and Shellfish Immunology: An Introduction*. Narendra Publ.
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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**SEMESTER-VI**

**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-2**

**AQUACULTURE MANAGEMENT**

**INTERNAL MARKS ALLOTMENT**

**Zoology Theory- Internal**

**Total Marks: 40**

1. Internals (2) marks	:	10
2. Assignments (2) marks	:	5x2=10
3. Project marks	:	10
4. Seminar marks	:	5
5. Attendance	:	5 marks

**EXTERNAL MARKS ALLOTMENT**

**Zoology Theory- External**

**Total Marks: 60**

**Section –A**

I. Short Answer questions (Any 5 from given 10) 1 to 10	5x4=20
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**Section –B**

II. Essay Questions (With internal choice) 11 to 15	5x8=40
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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc BZC**  
**SEMESTER-VI**  
**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-2**  
**AQUACULTURE MANAGEMENT**

**PRACTICAL MARKS ALLOTMENT**

**Zoology Practical's - External**

**Time: 3 hrs.**

**Total Marks: 25**

1. Major experiment	:	8 marks
2. Minor experiment	:	6 marks
3. Identification	:	6 marks
4. Viva voce	:	5 marks

**Zoology Practical's - Internal**

**Total Marks: 25**

1. Assessment	:	10 marks
2. Record	:	10 marks
3. Field note book	:	5 marks

**Question Paper Blue Print**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**SEMESTER-VI**

**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-2**

**AQUACULTURE MANAGEMENT**

**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS
UNIT –I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

- I. Short Questions : 5 x 4 = 20  
II. Essay Questions : 5 x 8 = 40

**Total : 60 Marks**

**Model Question Paper**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**SEMESTER-VI**

**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-2**

**AQUACULTURE MANAGEMENT**

**Time: 2½ hrs**

**Max Marks: 60**

**SECTION-A**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x4=20M**

1. Bundh breeding రండ్ పెంపకం
2. Induced breeding ప్రేరేపిత జననం
3. Water quality నీటి నాణ్యత
4. Liming మిశ్రమ చలుబు
5. Types of feeds మేతల రకాలు
6. Probiotics ప్రోబయోటిక్స్
7. Fish Immunization ఫిష్ ఇమున్ నైజేషన్
8. Explain Disease Management principles in fish culture.  
చికిత్స పరిపాలనలో వ్యాధి నిర్మూలన యజమాని పద్ధతులు గుర్తించి తెలపండి
9. Cost-benefit analysis వ్యయ-ప్రయోజన విశ్లేషణ
10. Transgenic fish జన్యు పరివర్తన చేప

**SECTION – B**

**II. Answer any FIVE of the following**

**5x8 = 40M**

**Draw neat labeled diagram wherever necessary.**

11. (a) Describe hatchery management of Indian major carps.  
భారతీయ ప్రధాన మత్స్య కర్రుల హాచరీ యజమాని పద్ధతులు వివరించండి.  
(or)  
(b) Describe breeding and hatchery management of Penaeus monodon.  
పెనీస్ మోనోడన్ నందరి ప్రేరేపిత మత్స్య హాచరీ యజమాని పద్ధతులు వివరించండి
12. (a) Describe water quality and soil characteristics suitable for fish culture.  
చికిత్స పరిపాలనకు అనుకూల నీటి నాణ్యత మరియు నేల లక్షణాల వివరించండి.  
(or)  
(b) Explain principles of aeration and emergency aeration.  
ఏరేషన్ సర్కూలేషన్ మరియు అత్యవసర ఏరేషన్ గుర్తించి తెలపండి

13. (a) Describe role of supplementary feeding in aquaculture.

ఆకలి కలిగి రోజులో అనూరంధ ఆహారం పొందనీ వసవరించుకుండి.

(or)

(b) Explain the feed formulation and manufacturing

ఫీడ్స్ సర్కరికరిణ్ మరళి ఁ తూ రీం వసవరించుకుండి

14. (a) Explain symptoms, prophylaxis and therapy of any four common diseases in fishes.

చిపలలో ఏవసీ న నాలుగకి సాధరిణ్ వ్యరి ధకిల లక్షణాలు, రకిగరింరొధకత్ మరళి ఁ చకిత్సీ వసవరించుకుండి

(or)

(b) Explain symptoms, prophylaxis and therapy of any four common diseases in shrimps

రియరి లలో ఏదసీ నా నాలుగకి సాధరిణ్ వ్యరి ధకిల

లక్షణాలు, రకిగరింరొధకత్ మరళి ఁ చకిత్సీ వసవరించుకుండి

15. (a) Write an essay on demand and price analysis in aquaculture.

గరకి మరళి ఁ సరిరిపరా మధరి గల వరిషణ్గరింరొధకత్ వ్యరించుకుండి

(or)

(b) Explain Fisheries training and Education in India.

భరిత్సీదరింలో గల మత్రిరి శరిక్షణ్ మరళి ఁ వరిదరి గరింరొధకత్ తెలప రిండి

Periods : 60

Max.Marks : 100

**Unit – I**

**1.1 Handling and Principles of fish Preservation**

1.1.1 Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.

1.1.2 Principles of preservation– cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to lowradiation of gamma rays.

**Unit – II**

**2.1 Methods of fish Preservation**

2.1.1 Traditional methods - sun drying, salt curing, pickling and smoking.

2.1.2 Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, Irradiation and Accelerated Freeze drying (AFD).

**Unit – III**

**3.1 Processing and preservation of fish and fish by-products**

3.1.1 Fish products – fish minced meat, fish meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.

3.1.2 Fish by-products – fish glue, ising glass, chitosan, pearl essence, shark fins, fish leather and fish maws.

**3.2 Seaweed Products**

3.2.1 Preparation of agar, algin and carrageen. Use of seaweeds as food for humanconsumption, in diseasetreatment and preparation of therapeutic drugs.

**ADDITIONAL INPUT: Cold storage units**

**Unit – IV**

**4.1 Sanitation and Quality control**

4.2.1 Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.

4.2.2 Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

4.2 Regulatory affairs in industries

**Unit – V**

**5.1 Quality Assurance, Management and Certification**

5.1.1 Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.

5.1.2 National and International standards – ISO 9000: 2000 Series of Quality Assurance System, *Codex Alimentarius*.

**REFERENCE BOOKS**

1. Balachandran KK. 2001. *Post-harvest Technology of Fish and Fish Products*. Daya Publ.
2. Clucas IJ. 1981. *Fish Handling, Preservation and Processing in the Tropics*. Parts I, II. FAO.
3. Gopakumar K. (Ed.). 2002. *Text Book of Fish Processing Technology*. ICAR.
4. Govindan, TK. 1985. *Fish Processing Technology*, Oxford-IBH.
5. Hall GM. (Ed). 1992. *Fish Processing Technology*. Blackie.
6. Huss HH, Jakobsen M & Liston J. 1991. *Quality Assurance in the Fish Industry*. Elsevier.
7. John DEV. 1985. *Food Safety and Toxicity*. CRC Press.
8. Larousse J & Brown BE. 1997. *Food Canning Technology*. Wiley VCH.
9. Nambudiri DD. 2006. *Technology of Fishery Products*. Fishing Chimes.

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**SEMESTER-VI**

**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-3**

**POSTHARVEST TECHNOLOGY**

**PRACTICAL - III**

**Max Marks-50**

**Project Work**

1. Visit to a fish breeding centre / fish farms and submit a project report  
or
2. Visit to a feed manufacturing unit and submit a project report  
or
3. Visit to a shrimp hatchery / shrimp farms and submit a project report  
or
4. Visit to a shrimp processing unit and submit a project report

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**SEMESTER-VI**

**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-3**

**POSTHARVEST TECHNOLOGY**

**INTERNAL MARKS ALLOTMENT**

**Zoology Theory- Internal**

**Total Marks: 40**

1. Internals (2) marks	:	10
2. Assignments (2) marks	:	5x2=10
3. Project marks	:	10
4. Seminar marks	:	5
5. Attendance	:	5 marks

**EXTERNAL MARKS ALLOTMENT**

**Zoology Theory- External**

**Total Marks: 60**

**Section –A**

1. Short Answer questions (Any 5 from given 10) 1 to 10	5x4=20
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**Section –B**

2. Essay Questions (With internal choice) 11 to 15	5x8=40
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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc BZC**  
**SEMESTER-VI**  
**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-3**  
**POSTHARVEST TECHNOLOGY**

**PRACTICAL MARKS ALLOTMENT**

**Zoology Practical's - External**

**Time: 3 hrs.**

**Total Marks: 25**

1. Major experiment	:	8 marks
2. Minor experiment	:	6 marks
3. Identification	:	6 marks
4. Viva voce	:	5 marks

**Zoology Practical's - Internal**

**Total Marks: 25**

1. Assessment	:	10 marks
2. Record	:	10 marks
3. Field note book	:	5 marks

## Question Paper Blue Print

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc BZC**  
**SEMESTER-VI**  
**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-3**  
**POSTHARVEST TECHNOLOGY**

### BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS
UNIT –I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

**Total : 60 Marks**

**Model Question Paper**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc BZC**

**SEMESTER-VI**

**ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-3**

**POSTHARVEST TECHNOLOGY**

**Time: 2½ hrs**

**Max**

**Marks: 60**

**SECTION-A**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x4=20**

1. Handling of fresh fish జ చిపల పటర్టరికొ వధనము
2. Rigor mortis రిగర్ మోరీనో
3. Smoking ధూమీకరుణమ
4. Canning డి లో రిద్పరిచుట్
5. Fish oil చాప న్యనె
6. Sea weeds which are useful for human consumption మనవ వీరింయిగింకి ఉపయోగపడి సర్మిమిద్ కలుపకి మికిక లు
7. Personal hygiene in processing plants ప్పస్సింపి వా త్ పరిశిరత్ రింట్లో కిగ
8. Regulatory affairs in industry పరిశిరమల రిగిరి లిట్టి పిర వహరాలు
9. Good Laboratory Practices GLPs మించ పయిగశాల పధధతికిలు
10. Codex alimentarius రిడెకో ఎలిమంటేరియస్

**SECTION-B**

**II. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x8=40**

11. (a) Describe the spoilages in marine fish. సర్మిమిద్ చిప కికి పివి వధనమకి వరివరించుండి.  
(OR)  
(b) Write an essay on Principles of preservation in fish చిపలకింలి చి చి పధధతికిల గురికి వ్పయింండి
12. (a) What are the Traditional methods used in preservation. సాంపిపధివయ పధధతికిలలో చిపలకింలి చి చి పధధతి  
(OR)  
(b) What are the advanced methods used in preservation. అధికినత్న పధధతికిల లో చిపలకింలి చి చి పధధతి



కిల గూరి'ి' వివయిండి

కిల గూరి'ి' వివయిండి





**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**EATZC- ZOOLOGY SYLLABUS**  
**SEMESTER-V**  
**PAPER – V**  
**CELLULAR METABOLISM AND MOLECULAR BIOLOGY**

**Periods: 60**

**Max. Marks:100**

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**Unit I: Biomolecules**

- 1.1 Carbohydrates - Classification of carbohydrates. Structure of glucose
- 1.2 Proteins - Classification of proteins. General properties of amino acids
- 1.3 Lipids - Classification of lipids
- 1.4 Nucleic acids - DNA – Structure and function; RNA - Structure, types and functions

**Unit II: Enzymes and Cellular Metabolism**

- 2.1. Introduction to biocatalysis, Enzymes and their classification, Enzyme kinetics. Mechanism of action. Inhibition and Regulation
- 2.2 Carbohydrate Metabolism - Glycolysis, Krebs Cycle, Gluconeogenesis,
- 2.3 Glycogen metabolism, Review of electron transport chain

**Unit - III : Cellular Metabolism and Cell Physiology**

- 3.1 Lipid Metabolism - Biosynthesis and  $\beta$  oxidation of palmitic acid
- 3.2 Protein metabolism - Transamination, Deamination and Urea Cycle
- 3.3 Transport functions of plasma membrane – Active, passive and facilitated transport
- 3.4 Cell junctions – Tight junctions, desmosomes, gap junctions

**Unit-IV: DNA as genetic material**

- 4.1 DNA structure, types (A,B,Z); DNA as genetic material (Griffith's Transformation, Hershey Chase experiment, McKarthy experiment)
- 4.2 Fine structure of gene

**Unit – V:Gene Expression**

- 5.1 Gene Expression in prokaryotes (Lac Operon)
- 5.2 Gene Expression in eukaryotes.
- 5.3 Transcription and Translation.

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**EATZC- ZOOLOGY PRACTICAL SYLLABUS**  
**SEMESTER-V**  
**PAPER – V**  
**CELLULAR METABOLISM AND MOLECULAR BIOLOGY**

**Periods: 24**

**Max. Marks: 50**

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1. Qualitative tests to identify functional groups of carbohydrates in given Solutions (Glucose, Fructose, Sucrose, Lactose)
2. Estimation of total protein in given solutions by Lowry's method.
3. Study of activity of salivary amylase under optimum conditions
4. Preparation of permanent slide to show the presence of Barr body in Human female blood cells or cheek cells
5. Mounting of salivary gland chromosomes of *Chironomous*

**Reference Books:**

- J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition .W.H. Freeman and Co.
- Nelson, D. L., Cox, M. M. and Lehninger, A.L. (2009). Principles of Biochemistry. IVEdition. W.H. Freeman and Co.
- Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009). Harper's Illustrated Karp, G. (2010), Cell and molecular biology : Concepts and experiments. VI edition. John Wiley and sons. Inc.
- De Robertis, EDP and De Robertis EMF (2006). Cell and molecular biology. VIII edition. Lippincott Williams and Wilkins, Philadelphia Biochemistry. XXVIII Edition. Lange Medical Books/Mc Graw3Hill.

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc (EAT.Z.C) ZOOLOGY THEORY**

**INTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – V**

**CELLULAR METABOLISM AND MOLECULAR BIOLOGY**

**Theory- Internal**

**Total Marks: 40**

- |                    |   |          |
|--------------------|---|----------|
| 1. Internals (2)   | : | 10 marks |
| 2. Assignments (2) | : | 10 marks |
| 3. Project         | : | 10 marks |
| 4. Seminar         | : | 10 marks |

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY THEORY**

**EXTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – V**

**CELLULAR METABOLISM AND MOLECULAR BIOLOGY**

**Theory- External**

**Total Marks: 60**

**Section –A**

- |  |        |
|--|--------|
| I. Short Answer questions (Any 5 from given 10)<br>1 to 10 | 5x4=20 |
|--|--------|

**Section –B**

- |  |        |
|--|--------|
| II. Essay Questions (With internal choice)<br>11 to 15 | 5x8=40 |
|--|--------|

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc (EAT.Z.C) ZOOLOGY**

**PRACTICAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – V**

**CELLULAR METABOLISM AND MOLECULAR BIOLOGY**

**Practical's – External**

**Total Marks : 25**

Project work/on-job training at industry-

**Practical's – Internal**

**Total Marks: 25**

- |               |   |          |
|---------------|---|----------|
| 1 .Assessment | : | 10 marks |
| 2. Record     | : | 10 marks |
| 3. Vivo Voce  | : | 5 marks  |

## Question Paper Blue Print

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (EAT.Z.C) ZOOLOGY THEORY

SEMESTER-V

PAPER – V

CELLULAR METABOLISM AND MOLECULAR BIOLOGY

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,  
Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,  
Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions :  $5 \times 4 = 20$
  2. Essay Questions :  $5 \times 8 = 40$
- Total : 60 Marks**

**MODEL QUESTION PAPER**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**EATZC- ZOOLOGY**

**SEMESTER-V**

**PAPER – V**

**CELLULAR METABOLISM AND MOLECULAR BIOLOGY**

**Time: 3 hrs**

**Max. Marks: 60**

**I. Answer any FIVE of the following:**

**4x5=20**

**Draw labeled diagrams wherever necessary**

1. Structure of Glucose
2. Properties of amino acids
3. Enzyme inhibition
4. Glycolysis
5. Desmosomes
6. Urea cycle
7. Hershey chase experiment
8. Types of DNA
9. Lac operon
10. Transcription

**II. Answer any FIVE of the following:**

**5x8=40**

**Draw labeled diagrams wherever necessary**

11. A. Write about the classification of lipids  
OR  
B. Explain the structure and functions of types of RNA
12. A. Write an essay on krebs cycle  
OR  
B. Describe the process of glycogen metabolism
13. A. Describe the biosynthesis and  $\beta$ -oxidation of palmitic acid  
OR  
B. Write an essay on transport functions of plasma membrane
14. A. Justify DNA as a genetic material  
OR  
B. Describe the fine structure of a gene
15. A. Explain the process of gene expression in prokaryotes  
OR  
B. Explain the process of gene expression in eukaryotes

□ □ □ □ □

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**EATZC- ZOOLOGY PRACTICAL SYLLABUS**

**SEMESTER-V**

**PAPER – VI**

**HAEMATOLOGY**

Hours 60

Marks 100

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**UNIT – I: Laboratory Preparation in Haematology:**

**10 Hours**

Introduction to practical. Basic requirements. Collection of blood. Anticoagulants and effects of anticoagulants on blood cell morphology. Effects of storage of blood.

**UNIT – II: Routine Haematology:**

**15 Hours**

Composition of blood. Haemoglobin synthesis. Various haemoglobins. Haemopoietic system of the body. Blood cell counts. Erythropoiesis, Leucopoiesis and development of blood corpuscles. Thrombopoiesis. Laboratory technique of haemocytometry. Clinical significance of Total erythrocyte count, total leucocyte count, differential count, erythrocyte sedimentation rate and platelet count.

**UNIT – III: Haemostasis and Haematological Diseases:**

**15 Hours**

General consideration of blood coagulation. Mechanism of coagulation. The fibrinolytic mechanism. Clinical significance of routine coagulation tests. Anaemia. Various types of anaemias – Iron deficiency anaemia, Aplastic anaemia, Perinicious anaemia, Sideroblastic anaemia and Sickel cell anaemia. Other haematological diseases – HDNB, Thalassaemia, Leukaemia.

**UNIT- IV: Automation in Haematology:**

**10 Hours**

General considerations. Blood cell counters. Flow through cytochemical differential counter. Automated coagulated systems.

**UNIT - V: Immunohaematology and Blood banking:**

**10 Hours**

Human Blood Group Systems. Inheritance of blood group systems. Blood transfusion.

**Deleted topics**

Parasitic infections of blood – structure and life cycle of Plasmodium vivax, types of malaria, Structure and life cycle of Wuchereria bancrofti.



### Reference Books

- Park, K. (2007), Preventive and Social Medicine, B.B. Publishers
- Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, II Edition, Bhalani Publishing House
- Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for Training Courses
- Guyton A.C. and Hall J.E. Textbook of Medical Physiology.
- Robbins and Cortan, Pathologic Basis of Disease, VIII Edition.
- Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**EATZC- ZOOLOGY PRACTICAL SYLLABUS**

**SEMESTER-V**

**PAPER – VI**

**HAEMATOLOGY**

- Routine haematological tests – Blood smear preparation, TC, DC, ESR, Platelet count.
- 6Determination of Haemoglobin.
- 7Determination of PCV.
- 8Determination of bleeding time.
- 9Determination of blood clotting time.
- 10Blood Grouping.

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc (EAT.Z.C) ZOOLOGY THEORY**

**INTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – VI**

**HAEMATOLOGY**

**Theory- Internal**

**Total Marks: 40**

- |                    |   |          |
|--------------------|---|----------|
| 1. Internals (2)   | : | 10 marks |
| 2. Assignments (2) | : | 10 marks |
| 3. Project         | : | 10 marks |
| 4. Seminar         | : | 10 marks |

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY THEORY**

**EXTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – V**

**HAEMATOLOGY**

**Theory- External**

**Total Marks: 60**

**Section –A**

- |  |        |
|--|--------|
| I. Short Answer questions (Any 5 from given 10)<br>1 to 10 | 5x4=20 |
|--|--------|

**Section –B**

- |  |        |
|--|--------|
| II. Essay Questions (With internal choice)<br>11 to 15 | 5x8=40 |
|--|--------|

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc (EAT.Z.C) ZOOLOGY**

**PRACTICAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – VI**

**HAEMATOLOGY**

**Practical's – External**

**Total Marks : 25**

Project work/on-job training at industry-

**Practical's – Internal**

**Total Marks: 25**

- |               |   |          |
|---------------|---|----------|
| 1 .Assessment | : | 10 marks |
| 2. Record     | : | 10 marks |
| 3. Vivo Voce  | : | 5 marks  |

## Question Paper Blue Print

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (EAT.Z.C) ZOOLOGY THEORY

SEMESTER-V

PAPER – V

HAEMATOLOGY

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,  
Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,  
Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
  2. Essay Questions : 5 x 8 = 40
- Total : 60 Marks**

**MODEL PAPER**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**EATZC- ZOOLOGY**

**SEMESTER-V**

**PAPER – VI**

**HAEMATOLOGY**

**Time: 3 hrs**

**Max. Marks: 60**

**I. Answer any FIVE of the following:**

**4 x5=20**

**Draw labeled diagrams wherever necessary**

1. Effect of coagulants on storage of blood
2. Erythropoiesis
3. Functions of Blood
4. Types of Haemoglobin
5. Hemolytic disease of newborn
6. Leukaemia
7. Electrical blood cell counter
8. Flow cytometry cell counter
9. Rh blood grouping
10. Blood transfusion

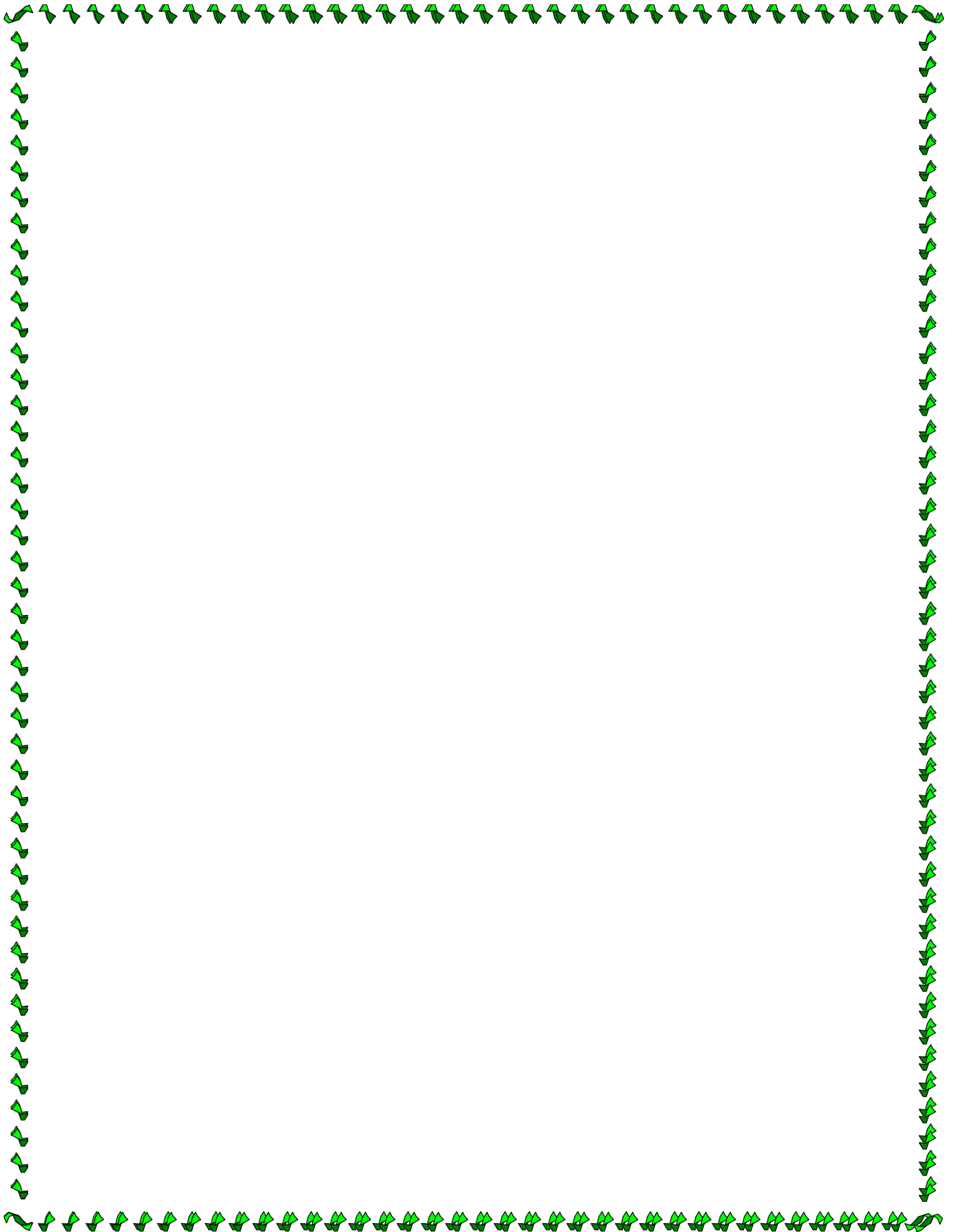
**II. Answer any FIVE of the following:**

**5x8=40**

**Draw labeled diagrams wherever necessary**

11. A. Write an essay on anticoagulants and their effect on blood cell morphology  
OR  
B. Write an essay on effects of storage of blood
12. A. Write an essay on synthesis of haemoglobin  
OR  
B. Write an essay on composition of blood
13. A. Write essay on mechanism of blood coagulation  
OR  
B. Write an essay on various types of anaemia
14. A. Write an essay on general consideration of automation in hematology  
OR  
B. Write an essay on blood cell counter
15. A. Write an essay on human blood grouping system  
OR  
B. Write an essay on Inheritance of blood groups

\*\*\*\*\*



**Course code:**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**EATZC- AQUACULTURE TECHNOLOGY SYLLABUS**

**SEMESTER-V**

**PAPER – V**

**FISH HEALTH MANGEMENT**

**UNIT I: PATHOLOGY AND PARASITOLOGY**

1-1 Introduction to fish diseases –Definition and categories of diseases – Disease and environment

1-2 Disturbance in cell structure – changes in cell metabolism, progressive and retrogressive tissue changes, types of degeneration, infiltration, necrosis, cell death and causes

1-3 Atrophy, hypertrophy, neoplasms, inflammation, healing and repair

**UNIT II: DISEASES OF FIN FISH**

2-1 Fungal diseases (both of shell and finfish) – Saprolegniosis, brachiomycosis, ichthyophorus diseases – Lagenidium diseases – Fusarium disease, prevention and therapy

2-2 Viral diseases – Emerging viral diseases in fish, haemorrhagic septicemia, spring viremia of carps, infectious hematopoietic necrosis in trout, infectious pancreatic necrosis in salmonids, swim-bladder inflammation in cyprinids, channel cat fish viral disease, prevention and therapy

2-3 Baterial diseases – Emerging bacterial diseases, aeromonas, pseudomonas and vibrio infections, columnaris, furunculosis, epizootic ulcerative syndrome, infectious abdominal dropsy, bacterial gill disease, enteric red mouth, bacterial kidney disease, proliferative kidney disease, prevention and therapy

**UNIT III: DISEASES OF SHELL FISH**

3-1 Major shrimp viral diseases – Baculovirus penaeii, Monodon Baculovirus, Baculoviral midgut necrosis, Infectious hypodermal and haematopoietic necrosis virus, Hepatopancreatic parvo like virus, Yellow head baculovirus, white spot baculovirus.

3-2 Bacterial diseases of shell fish – aeromonas, pseudomonas and vibrio infections, luminous bacterial disease, filamentous bacterial disease. Prevention and therapy

3-3 Protozoan diseases- Ichthyophthiriasis, Costiasis, whirling disea/ses, trypanosomiasis. Prevention and therapy

**UNIT IV: NUTRITIONAL DISEASES**

4-1 Nutritional pathology – lipid liver degeneration, Vitamin and mineral deficiency diseases. Aflatoxin and dinoflagellates.

4-2 Antibiotic and chemotherapeutics. Nutritional cataract. Genetically and environmentally induced diseases.

**UNIT V: FISH HEALTH MANAGEMENT**

5-1 Diagnostic tools – immune detection- DNA/RNA techniques, General preventive methods and prophylaxis. Application and development of vaccines.

5-2 Quarantine – Significance, methods and regulations for transplants.

5-3 Production of disease-free seeds. Evaluation criteria of healthy seeds.

5-4 Good Feed management for healthy organisms, Zero water exchange, Probiotics in health management, Issues of biosecurity.

**Course code:**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**EATZC- AQUACULTURE TECHNOLOGY PRACTICAL SYLLABUS**

**SEMESTER-V**

**PAPER – V**

**FISH HEALTH MANGEMENT**

**Periods: 24**

**Max. Marks: 50**

1. Enumeration of Bacteria by TPC Method
2. Enumeration of total Coliforms
3. Observation of gross pathology and external lesions of fish and prawn with reference to the common diseases in aquaculture
4. Examination of pathological changes in gills and gut lumen, lymphoid organ, muscles and nerves of fish
5. Examination of pathological changes in gut lumen, hepatopncreas, lymphoid organ, muscles and nerves of prawn and shrimp
6. Collection, processing and analysis of data for epedemeiological investigations of viral diseases
7. Bacterial pathogens – isolation, culture and characterization
8. Identification of parasites in fishes: Protozoan, Helmiths, Crustaceans
9. Antibiograms – preparation and evaluation
10. Molecular and immunological techniques; Biochemical tests; PCR; ELISA; Agglutination test; Challenge tests; Purification of virus for development of vaccines (Demonstration at institutes/labs)
11. Estimation of dose, calculation of concentration, methods of administration of various chemotherapeutics to fish and shell fish
12. Estimation of antibiotics used in aquaculture practices
13. Estimation of probiotics used in aquaculture
14. Field visit to farm for health monitoring and disease diagnosis

**PRESCRIBED BOOK(S):**

1. Shaperclaus W. 1991 Fish Diseases- Vol.I & II. Oxonian Press Pvt.ltd
2. Roberts RJ 1989. Fish pathology. Bailliere Tindall, New York
3. Lydia Brown 1993. Aquaculture for veterinarians- fish husbandray and medicine. Pergamon Press. Oxford

**REFERENCES:**

1. Shankar KM & Mohan CV. 2002. Fish and Shellfish Health Management. UNESCO Publ. Sindermann CJ. 1990
2. Walker P & Subasinghe RP. (Eds.). 2005 Principal Diseases of Marine Fish and Shellfish. Vols. I, II. 2nd Ed. Academic Press
3. DNA Based Molecular Diagnostic Techniques: Research Needs for Standardization and Validation of the Detection of Aquatic Animal Pathogens and Diseases. FAO Publ. Wedmeyer G, Meyer FP & Smith L. 1999.
4. Bullock G et.al., 1972 Bacterial diseases of fishes. TFH publications, New Jersey
5. Post G 1987. Text book of Fish Health. TFH publications, New Jersey
6. Johnson SK 1995. Handbook of shrimp diseases. Texas A & M University, Texas

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY THEORY**

**INTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – V**

**FISH HEALTH MANGEMENT**

**Theory- Internal**

**Total Marks: 40**

- |                    |   |          |
|--------------------|---|----------|
| 1. Internals (2)   | : | 10 marks |
| 2. Assignments (2) | : | 10 marks |
| 3. Project         | : | 10 marks |
| 4. Seminar         | : | 5 marks  |
| 5. Attendance      | : | 5 marks  |

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY THEORY**

**EXTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – V**

**FISH HEALTH MANGEMENT**

**Theory- External**

**Total Marks: 60**

**Section –A**

- |  |        |
|--|--------|
| I. Short Answer questions (Any 5 from given 10)<br>1 to 10 | 5x4=20 |
|--|--------|

**Section –B**

- |  |        |
|--|--------|
| II. Essay Questions (With internal choice)<br>11 to 15 | 5x8=40 |
|--|--------|

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY**  
**PRACTICAL MARKS ALLOTMENT**  
**SEMESTER-V**  
**PAPER – V**  
**FISH HEALTH MANGEMENT**

**Practical's - External**

**Time: 3 hrs.**

**Total Marks: 25**

- |                     |   |         |
|---------------------|---|---------|
| 1. Major experiment | : | 8 marks |
| 2. Minor experiment | : | 6 marks |
| 3. Identification   | : | 6 marks |
| 4. Viva voce        | : | 5 marks |

**Practical's – Internal**

**Total Marks: 25**

- |                    |   |          |
|--------------------|---|----------|
| 1. Assessment      | : | 10 marks |
| 2. Record          | : | 10 marks |
| 3. Field note book | : | 5 marks  |

**Question Paper Blue Print**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY**  
**SEMESTER-V**  
**PAPER – V**  
**FISH HEALTH MANGEMENT**  
**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTION S	MARKS ALLOTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTED FOR EACH QUESTION	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,  
Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,  
Internal Choice (either / or) and 5 Questions has to be answered.

Short Questions : 5 x 4 = 20

Essay Questions : 5 x 8 = 40

**Total : 60 Marks**

Model Question Paper

Course code:

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY  
SEMESTER-V  
PAPER – V  
FISH HEALTH MANAGEMENT**

**Time: 3 hrs**

**Max Marks: 60**

**SECTION-A**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x4=20**

1. Necrosis
2. Inflammation
3. Aeromonas in Fin fish
4. Fusarium in Fin fish
5. Costiasis in shell fish
6. Yellow head baculovirus in shell fish
7. Aflatoxin
8. Zero water exchange
9. Mineral deficiency
10. Probiotics

**SECTION-B**

**II. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x8=40**

11. a. Explain progressive and retrogressive tissue changes in fish.  
(or)  
b. Describe cell death and causes in fish
12. a. Explain any three fungal diseases in fin fish with preventive and therapeutic measures.  
(or)  
b. Describe spring viremia of carps and infectious pancreatic necrosis in Salmonids.
13. a. Explain any three viral diseases in shell fish.  
(or)  
b. Explain preventive and therapeutic measures of protozoan diseases in shell fish.
14. a. Describe vitamin deficiency diseases in Fin fish.  
(or)  
b. Explain genetically induced diseases in Fin fish
15. a. Describe immune detection techniques used in shell fish  
(or)  
b. Write an account on Probiotics in health management of shell fish.

**Course code:**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY SYLLABUS**

**SEMESTER-V**

**PAPER – VI**

**FISHERIES EXTENSION, ECONOMICS & MARKETING**

**Periods: 60**

**Max. marks: 100**

**UNIT – 1 INTRODUCTION**

1-1 Meaning and scope of economics with reference to fisheries

1-2 Basic concepts of economics – goods, services, wants and utility, demand and supply, value price, market demand and individual demand, elasticity of demand, law of diminishing marginal utility

1-3 Theory of production, production function in fisheries

1-4 Various factors influencing the fishery product's price

**UNIT – II FISHERIES MARKETING**

2-1 Basic marketing functions, consumer behaviour and demand, fishery market survey and test marketing a product

2-2 Fish marketing – prices and price determination of fishes

2-3 Marketing institutions- primary( producer fishermen, fishermen cooperatives, and fisheries corporations) and secondary (merchant/agent/speculative middlemen)

2-4 Methods of economic analysis of business organizations

2-5 Preparation of project and project appraisal

**UNIT-III FISHERIES ECONOMICS**

3-1 Aquaculture economics- application of economics principles to aquaculture operations

3-2 Various inputs and production function. Assumptions of production function in aquaculture analysis, least cost combination of inputs, laws of variable proportions

3-3 Cost and earnings of aquaculture systems – carp culture, shrimp farming systems, hatcheries, Cost and earnings of fishing units and freezing plants

3-4 Socio-economic conditions of fishermen in Andhra Pradesh, Role of Matsyafed and NABARD in uplifting fishermen's conditions, fishermen cooperatives

3-5 Contribution of fisheries to the national economy

**UNIT-IV FISHERIES EXTENSION**

4-1 Fisheries extension – scope and objectives, principles and features of fisheries extension education

4-1.1 Fisheries extension methods and rural development

4-3 Adoption and diffusion of innovations

**UNIT-V TRANSFER OF TECHNOLOGY**

5-1 ICAR programs – salient features of ORP, NDS, LLP, IRDP, ITDA, KVK, FFDA, FCS, FTI, TRYSEM

5-2 Training – meaning, training vs. education and teaching

5-3 DAATT centres and their role in tot programs, video conferencing, education of farmers through print and electronic media

**Course code:**

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY  
PRACTICAL SYLLABUS  
SEMESTER-V  
PAPER – VI  
FISHERIES EXTENSION, ECONOMICS & MARKETING**

**Periods: 24**

**Max. Marks: 50**

Project work/on-job training at industry

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**PRESCRIBED BOOK(S):**

1. Adivi Reddy sv 1997. An introduction to extension education. Oxford & IBH Co.Pvt. Ltd. New Delhi
2. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal Science University. Tuticorn
3. Subba Rao N 1986. Economics of Fisheries. Daya publishing house, Delhi

**REFERENCES:**

1. Dewwett KK and Varma JD 1993. Elementary economic theory. S.chand, New Delhi
2. Korakandy R 1996. Economics of Fisheries Mangement. Daya Publishing House, Delhi
3. Tripathi SD 1992. Aquaculture Economics. Asian Fisheries Society, Mangalore.

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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY THEORY**

**INTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – VI**

**FISHERIES EXTENSION, ECONOMICS & MARKETING**

**Theory- Internal**

**Total Marks: 40**

1. Internals (2)	:	10 marks
2. Assignments (2)	:	10 marks
3. Project	:	10 marks
4. Seminar	:	5 marks
5. Attendance	:	5 marks

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY THEORY**

**EXTERNAL MARKS ALLOTMENT**

**SEMESTER-V**

**PAPER – V**

**FISHERIES EXTENSION, ECONOMICS & MARKETING**

**Theory- External**

**Total Marks: 60**

**Section –A**

I. Short Answer questions (Any 5 from given 10) 1 to 10	5x4=20
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**Section –B**

II. Essay Questions (With internal choice) 11 to 15	5x8=40
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**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY**  
**PRACTICAL MARKS ALLOTMENT**  
**SEMESTER-V**  
**PAPER – VI**  
**FISHERIES EXTENSION, ECONOMICS & MARKETING**

**Practical's – External**

**Total Marks : 25**

Project work/on-job training at industry-

**Practical's – Internal**

**Total Marks: 25**

- |               |   |          |
|---------------|---|----------|
| 1 .Assessment | : | 10 marks |
| 2. Record     | : | 10 marks |
| 3. Vivo Voce  | : | 5 marks  |

## Question Paper Blue Print

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY THEORY**  
**SEMESTER-V**  
**PAPER – V**  
**FISHERIES EXTENSION, ECONOMICS & MARKETING**  
**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,  
Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,  
Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions :  $5 \times 4 = 20$
2. Essay Questions :  $5 \times 8 = 40$

**Total : 60 Marks**

Model Question Paper

Course code:

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY  
SEMESTER-V  
PAPER – VI  
FISHERIES EXTENSION, ECONOMICS AND MARKETING**

Time: 3 hrs

Max Marks: 60

**SECTION-A**

**I. Answer any FIVE of the following  
Draw labeled diagram wherever necessary** **5x4=20**

1. Value price
2. Market demand and individual demand
3. Fishery market survey
4. Fishermen cooperatives
5. Role of NABARD in fisheries
6. Contribution of fisheries to the national economy
7. Scope and objective of fisheries extension education
8. Adoption of innovation
9. Education of farmers through electronic media
10. LLP-Lab to Land Programme

**SECTION-B**

**II. Answer any FIVE of the following  
Draw labeled diagram wherever necessary** **5x8=40**

11. a. Explain various factors influencing the fishery products price.  
(or)  
b. Describe the theory of production in relation to fisheries
12. a. Describe price determination of fishes in market.  
(or)  
b. Explain basic marketing functions of fish.
13. a. Explain cost and earning of shrimp farming systems.  
(or)  
b. Explain the role of Matsyafed in uplifting fishermen's condition.
14. a. Explain scope and objectives of fisheries extension education.  
(or)  
b. Explain fisheries extension methods
15. a. Describe the salient features of FFDA  
(or)  
b. Explain the role DAATT centers and their role in tot programs.

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc ATZC**  
**AQUACULTURE TECHNOLOGY - SUBJECT ELECTIVE SYLLABUS**  
**SEMESTER-VI**  
**PAPER-VII A**  
**ORNAMENTAL FISHERY**

**UNIT I: INTRODUCTION**

- 1-1 Aquarium and ornamental fishes – introduction
- 1-2 Present status of Aquarium trade in the world and India
- 1-3 Aquarium accessories – aerators, filters, lighters and heaters
- 1-4 Water quality needs and different kinds of feeds

**UNIT II: FRESH WATER ORNAMENTAL FISHES**

- 2-1 Live bearers, gold fish, koi, gourami, barbs and tetras, angel fish and cichlid fish
- 2-2 Brood stock development, breeding, larval rearing and grow out
- 2-3 Larval feeds and feeding

**UNIT III: MARINE ORNAMENTAL FISHES**

- 3-1 Varieties and habitat of marine ornamental fishes
- 3-2 major marine ornamental fish resources of India
- 3-3 Collection and transportation of live fish, use of anaesthetics
- 3-4 Breeding of marine ornamental fish
- 3-5 Other aquarium animals – sea anemones, lobsters, worms, shrimps, octopus and starfish

**UNIT IV: AQUARIUM MANAGEMENT**

- 4-1 Setting up fresh water, marine and reef aquariums
- 4-2 Water quality management for different types of aquariums
- 4-3 Common diseases of aquarium fish, diagnosis and treatment
- 4-4 Temperature acclimatization and oxygen packing for aquarium fish

**UNIT V: COMMERCIAL PRODUCTION OF AQUARIUM FISH AND PLANTS**

- 5-1 Commercial production units of ornamental fish- requirements and design
- 5-2 Commercial production of goldfish, live bearers, gouramies, barbs, angels and tetras
- 5-3 Mass production of aquarium plants
- 5-4 Retail marketing and export of ornamental fish

**REFERENCES:**

- 1. Jameson JD and Santhanam R 1996. Manual of ornamental fishes and farming technologies, Fisheries College and research institute, Tuticorin
- 2. Stephen Spotte 1993. Marine aquarium keeping. John Wiley and sons, USA

**PRESCRIBED BOOK(S):**

- 1. Dick Mills 1998. Aquarium fishes, Dorling Kindersly Ltd, London
- 2. Van Ramshort JD 1978. The complete aquarium encyclopaedia, Elsevier

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY**  
**SEMESTER VI**  
**SUBJECT ELECTIVE**  
**PAPER-VIIA**  
**ORNAMENTAL FISHERY**

**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

**Total : 60 Marks**

**Model Question Paper**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
III B.Sc ATZC  
AQUACULTURE TECHNOLOGY - SUBJECT ELECTIVE  
SEMESTER VI – PAPER-VIIA  
ORNAMENTAL FISHERY**

**Time: 3 hrs**

**Max Marks: 60**

**SECTION-A**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x4=20**

1. Present status of aquarium in India
2. Nitrogen cycle
3. Gold fish
4. Larval feeds
5. Use of anaesthetics
6. Natural breeding in marine ornamental fish
7. Tetras
8. Design of ornamental unit
9. Bat fish
10. Eichhornia

**SECTION-B**

**II. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x8=40**

11. a. Explain various accessories used in aquarium  
(or)  
b. Explain any four water quality parameters used in fresh water aquarium
12. a. Explain brood stock development in ornamental fish  
(or)  
b. Describe any four live bearers of ornamental fish
13. a. Describe collection & transportation of live fish  
(or)  
b. Explain major marine ornamental fish resources of india
14. a. Explain any four bacterial diseases in aquarium fish  
(or)  
b. Describe water quality management of freshwater aquarium fishes
15. a. Explain commercial production of gold fish  
(or)  
b. Explain production of aquarium plants

**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY  
SYLLABUS FOR CLUSTER ELECTIVE –VIII-1  
SEMESTER-VI**

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**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**

**III B.Sc ATZC**

**SEMESTER VI**

**CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY**

**PAPER VIII – 1A**

**FISH PROCESSING TECHNOLOGY**

**Unit 1**

Introduction: Principles of fish preservation. Importance of hygiene and sanitation in fish handling. Quality of water and ice in fish handling and processing. Preparation of ice. Different types of ice used in the seafood industry and their merits. Preservation by refrigerated seawater and chilled seawater

**Unit 2**

Freezing and Canning: Fundamental principles involved in chilling and freezing of fish and fishery products. Various freezing methods. Freezing of shrimps and fishes. Changes during the cold storage of fish and fishery products. Principles involved in canning of fish. Different types of containers. Different stages of canning of Tuna. Retortable pouch processing.

**Unit 3**

Drying, Smoking and Freeze-drying: (9 Hrs) Principles of smoking, drying and salting of fish, factors affecting drying. Traditional drying / curing methods. Different types of drying. Drying of fish and prawns. Packing and storage of dried products. Spoilage of dried products. Preventive measures. Standards for dry fish products. Cold smoking. Principles of freeze drying. Accelerated freeze drying and packing of freeze dried products. Modern methods of preservation by irradiation and modified atmospheric storage.

**Unit 4**

Packing, Cold Storage and Export of Fishery Products: Functions of packing. Different types of packing materials and its quality evaluation. Packing requirements for frozen and cured products. Statutory requirements for packing. Labeling requirements. Different types of cold storages. Insulated and refrigerated vehicles.

**Unit 5**

Export of fishery products from India - major countries, important products, export documents and procedures. Prospects and constraints in export including tariff and non-tariff barriers, marine insurance, export incentives, registered exporters

**Reference Books:**

1. A.M.Martin, Fisheries – Processing Chapman & Hall, Madras
2. Ed.G.M.Hall –Fish Processing Technology Chopra & Hall. Madras.

**Text books:**

1. K.Gopakumar, Fish Processing Technology, ICAR, New Delhi
2. T.K. Govindan, Fish Processing Technology Oxfor & IBH Publication Co.
3. K.K. Balachandran Fish Canning – Principles & Practices.
4. Borgstrom,G. Fish as Food.
5. K.K. Balachandran, Postharvest Technology in Fish and Fishery Products.
6. Moorjani,M.V. Fish Processing in India.
7. Connell,J.J. Advances in Fishery science and Technology.
8. CIFT. Manual of Quality Control in Fish and Fishery Products.
9. Gopakumar,K. Fish Packaging Technology

**Question Paper Blue Print**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY  
SEMESTER VI  
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY  
PAPER VIII – 1A  
FISH PROCESSING TECHNOLOGY**

**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS
UNIT - I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,  
Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,  
Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

**Total : 60 Marks**

**Model Question Paper**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY  
SEMESTER VI  
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY  
PAPER VIII – 1A  
FISH PROCESSING TECHNOLOGY**

**Time: 3 hrs**

**Max Marks: 60**

**SECTION-A**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x4=20**

1. Types of ice used in sea food industry
2. Chilled sea water preservation
3. Canning
4. Types of containers
5. Smoking
6. Traditional drying
7. Low density poly ethylene(LDPE) & High density poly ethylene(HDPE)
8. Insulated vehicles
9. Marine insurance
10. Export incentives

**SECTION-B**

**II. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x8=40**

11. a. Describe three methods of storing fish in ice on fishing vessels  
(or)  
b. Explain importance of hygiene & sanitation in fish handling
12. a. Explain principle, methods & application in freezing of fish  
(or)  
b. Explain principles involved in canning of fish
13. a. Explain salting & drying methods in fish preservation  
(or)  
b. Explain different packing & storage methods of fish & prawn dried products
14. a. Explain packing used in freshwater fish processing  
(or)  
b. Describe different types of cold storages
15. a. Discuss export documents & procedures of fish & prawn  
(or)  
b. Discuss tariff & non-tariff barriers in exporting fish & prawn

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**SEMESTER VI**  
**CLUSTER ELECTIVE – 1-POST HARVEST TECHNOLOGY**  
**PAPER VIII – 1B**  
**FISHERY MICROBIOLOGY AND FISHERY BY-PRODUCTS**

**Unit 1:**

Introduction: History and development of microbiology –Different members of the microbial community – General characteristics of bacteria, fungi, viruses, algae and protozoans.

Ultrastructure of prokaryotic cell – structure and function of bacterial cell wall, plasmamembrane, capsule, flagella and endospore. Structure of fungi and yeast cell. Ultrastructure of virus – classification of viruses, Llife cycle bacteriophages - lytic and lysogenic cycle.

**Unit 2:**

Aquatic Microbiology: Microflora of aquatic environment, Different culture techniques.

Nutrition and growth of bacteria – different types of media for isolation of bacteria and fungi.

Isolation, enumeration, preservation and maintenance of cultures. Routine tests for identification of bacteria – morphological, cultural biochemical and serological. Basics of mycological and virological techniques.

**Unit 3:**

Fish Microbiology: Perishability of seafood – Fish as an excellent medium for growth of microorganisms. Spoilage microflora of fish and shellfish. Intrinsic and extrinsic factors affecting spoilage.

**Unit 4:**

Fishery By-Products: Fish meal, fish protein concentrate, shark fin rays, fish maws, isinglass, fish liver oil, fish body oil, fish hydrolysates, chitin, chitosan, glucosamine hydrochloride, squalene, pearl essence, ambergris, gelatin, beche-de-mer, fish silage, fish ensilage and seaweed products like agar, alginic acid and carragenan.

**Unit 5:**

Value Added Products. Value addition in sea food. Different types of value added products from fish and shell fishes – status of value addition in Indian seafood sector. Advantages of value addition. Fish mince and Surimi. Analog and fabricated products. Preparation of coated fishery products. Different types of batter and breading and its applications. Preparation of products viz. fish / prawn pickle, fish wafers, prawn chutney powder, fish soup powder, fish protein hydrolysate, fish stacks, fillets, fish curry, mussel products, marinated products.

**Text Books:**

1. Pelzar, Reid & Chan – Microbiology
2. Prescott, Harley & Klein – Microbiology
3. Adelogerg, Ingra & Wheates – Introduction to Microbial World
4. Windsor and Barlow. Introduction to Fishery Byproducts.
5. CIFT. Proceedings on Summer Institute on Non-traditional Diversified Fish Products&Byproducts.
6. Anon. Productivity in Aquatic Bodies.
7. Chincheste,C.O. and Graham,H.D. Microbial Safety of Fishery Products.
8. Amerine,M.A. and Pangborm,R.M. Principles of Sensory Evaluation of Foods.
9. Connell,J.J. Control of Fish Quality
10. Bigh,E.G. Seafood Science and Technology
11. Gopakumar.K Tropical Fishery Products

**Reference Books**

1. Kreuzer,R. Fishery Products.
2. Borgstrom,G .Fish as Food
3. Suzuki,T. Fish and Krill Protein: Processing Technology

**Question Paper Blue Print**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY**  
**SEMESTER VI**  
**CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY**  
**PAPER VIII – 1B**  
**FISHERY MICROBIOLOGY AND FISHERY BY-PRODUCTS**

**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
	Short Questions			Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTTED FOR EACH QUESTION	TOTAL MARKS
UNIT - I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,  
Out of 10 Questions 5 has to be answered.

**Section-B:** Questions numbers 11 to 15,  
Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

**Total : 60 Marks**

**Model Question Paper**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY  
SEMESTER VI  
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY  
PAPER VIII – 1B  
FISHERY MICROBIOLOGY AND FISHERY BY-PRODUCTS**

**Time: 3 hrs**

**Max Marks: 60**

**SECTION-A**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x4=20**

1. Endospore
2. Structure of prokaryotic cell
3. Anaerobic media
4. Oxidase test
5. Luminescent bacteria
6. Oxygen concentration
7. Fish liver oil
8. pearl essence
9. Advantages of value addition products
10. Fish mince

**SECTION-B**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x8=40**

11. a. Describe the structure & function of plasma membrane  
(or)  
b. Explain lifecycle of bacteriophage with lytic & lysogenic cycles
12. a. Explain different types of media for isolation for bacteria  
(or)  
b. Explain different culture techniques & isolation of fungi
13. a. Explain spoilage microflora of shell fish  
(or)  
b. Describe extrinsic factors affecting fish spoilage
14. a. Explain any four fish by products  
(or)  
b. Explain production of agar
15. a. Describe the status of value addition & advantages Indian seafood sector  
(or)  
b. Explain battered & breaded fish products

**SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.**  
**III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY**  
**SEMESTER VI**  
**CLUSTER ELECTIVE – 1-POST HARVEST TECHNOLOGY**  
**PAPER VIII – 1C**  
**QUALITY CONTROL IN PROCESSING PLANTS**

**Unit 1:**

Quality management, total quality concept and application in fish trade. Quality assessment of fish and fishery products - physical, chemical, organoleptic and microbiological quality standards. Quality Assurance-Inspection and quality assurance:

**Unit 2:**

Fish inspection in India, process water quality in fishery industry, product quality. Water analysis, treatments, chlorination, ozonisation, UV radiation, reverse osmosis, techniques to remove pesticides and heavy metals.

**Unit 3:**

Sensory evaluation of fish and fish products, basic aspects, different methods of evaluation, taste panel selection & constitution, statistical analysis Quality problem in fishery products: good manufacturing practices. HACCP and ISO 9000 series of quality assurance system, validation and audit. national and international standards, EU regulation for fish export trade,

**Unit 4:**

IDP and SAT formations in certification of export worthiness of fish processing units, regulations for fishing vessels pre-processing and processing plants, eu regulations. Factory sanitation and hygiene: National and international requirements, SSOP.

**Unit 5:**

Hazards in sea foods: Sea food toxins, biogenic amines, heavy metals and industrial pollutants. Infection and immunity, Microbial food poisoning, bacteria of public health significance in fish / fishery products / environments - Salmonella, Clostridia, Staphylococcus, E. coli, Streptococcus, Vibrio, Aeromonas, Listeria, Yersinia, Bacillus. Laboratory techniques for detection and identification of food poisoning bacteria. Mycotoxins in cured fish, bacterial associated with fish disease.

**Reference Books**

1. Ellis Harward. 18 Felix S, Riji John K, Prince Jeyaseelan MJ & Sundararaj V. 2001 Bacterial Fish Pathogens (Diseases in Farm and Wild)
2. Fish Disease Diagnosis and Health Management. Fisheries College and Research Institute, T.N. Veterinary and Animal Sciences University. Thoothukkudi. Inglis V, Roberts RJ & Bromage NR. 1993.

**Question Paper Blue Print**

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III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY  
SEMESTER VI  
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY  
PAPER VIII – 1C  
QUALITY CONTROL IN PROCESSING PLANTS**

**BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS**

	Section A			Section B		
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UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

**Section-A:** Questions numbers 1 to 10,  
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Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions :  $5 \times 4 = 20$
2. Essay Questions :  $5 \times 8 = 40$

**Total : 60 Marks**

**Model Question Paper**

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.  
III B.Sc (EAT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY**

**III B.Sc ATZC**

**SEMESTER VI**

**CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY**

**PAPER VIII – 1C**

**QUALITY CONTROL IN PROCESSING PLANTS**

**Time: 3 hrs**

**Max Marks: 60**

**SECTION-A**

**I. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x4=20**

1. Objectives of Quality control
2. Organoleptic quality assessment of fish
3. Chlorination
4. BOD and COD
5. GMPs
6. ISO 9000 series
7. Regulations for fishing vessels
8. SSOP
9. Heavy metals in seafoods
10. Mycotoxins in cured fish

**SECTION-B**

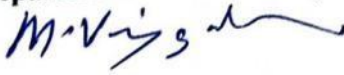

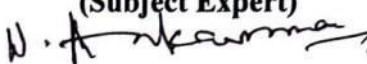



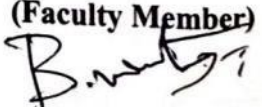
**II. Answer any FIVE of the following**

**Draw labeled diagram wherever necessary**

**5x8=40**

11. a. Describe the chemical & microbiological methods in quality assessment of fish  
(or)  
b. Explain quality assurance of sea food products
12. a. Write about the quality control and pre-shipment inspection of fish and fishery products.  
(or)  
b. Explain various techniques to remove heavy metals
13. a. Explain about different sensory evaluation methods of fish & fish products  
(or)  
b. What is meant by HACCP? Explain the principles in HACCP.
14. a. Describe IDP & SAT formation in certificate of fish processing units  
(or)  
b. Write an essay on fish factory sanitation & hygiene
15. a. Write briefly about different sea food toxins.  
(or)  
b. Write about any six bacteria which are of public health significance in fish and fishery products.

## Signatures of the Members in BOS/Upgradation

1. **Dr. M.VIJAYA KUMAR**  
Lecturer in Zoology  
SRR & CVR GDC (A)  
Vijayawada  
(In-charge of the Department & Chairman, BOS)  

2. **Dr.J.NAVEENA LAVANYA LATHA**  
Krishna University  
Machilipatnam  
(University Nominee)  

3. **Dr. N. ANKAMMA**  
Associate Professor,  
Department of Zoology,  
Govt. College for Women (Autonomous),  
Guntur.A.P  
(Subject Expert)  

4. **Dr.G.VANI**  
Lecturer in Zoology,  
DRG Government Degree College  
Tadepalligudem.  
West Godavari District. A.P  
(Subject Expert)  

5. **Sri. B.APPALA NAIDU**  
Assistant Project Manager-Tilapia Fish Project  
Rajiv Gandhi centre for Aquaculture (RGCA)  
Manikonda  
(Industrial Expert )  

6. **N.SUNEETHA**  
Lecturer in Zoology  
SRR & CVR GDC (A),  
Vijayawada  
(Faculty Member)  

7. **A.L.K.KRUPAVARM**  
Lecturer in Zoology  
SRR & CVR GDC (A),  
Vijayawada  
(Faculty Member)  

8. **B.VADAVATHI**  
Lecturer in Zoology  
SRR & CVR GDC (A),  
Vijayawada  
(Faculty Member)  
