

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

MACHAVARAM, VIJAYAWADA-520004

DEPARTMENT OF ZOOLOGY



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

(2022-23)

Dated: 29/07/2022

Courses

Skill Enhancement Courses: III B.Sc-BZC (Zoology): Semester V (w.e.f-2022-23)
(As per APSCHE and CBCS Pattern Semester System)

I B.Sc-ATZC (Zoology & Aquaculture): Semester I & II

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 **29th July 2022** in the **Zoology Department** of the college for the up gradation of the syllabus for **III B.Sc BZC Zoology subject syllabus for Semester V Skill Enhancement courses as per the new syllabus proposed by APSCHE with CBCS pattern and semester system and I. B.Sc ATZC Zoology and Aquaculture Technology subjects syllabus for Semester I & II (2022-2023)** 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. M.Sridhar

(Guest 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)

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The following members attended the meeting:

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

Lecturer in Zoology

SRR & CVR GDC (A)

Vijayawada

M. Vijaya Kumar
(In-charge of the Department & Chairman, BOS) 29/7/22

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

Krishna University

Machilipatnam

(University Nominee)

J. Naveena Lavanya Latha
29/7/2022

3. **Dr. N. ANKAMMA**

Associate Professor,

Department of Zoology,

Govt. College for Women (Autonomous),

Guntur.A.P

N. Ankamma
(Subject Expert) 29/7/22

4. **Dr.G.VANI**

Lecturer in Zoology,

DRG Government Degree College

Tadepalligudem.

West Godavari District. A.P

(Subject Expert)

G. Vani
29.7.22

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) 29/7/21

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

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


(Faculty Member)

8. **M.Sridhar**

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


(Guest Faculty Member)

AGENDA

1. Approval of the Syllabus, Model Question paper, Blue Print of the following
 - A. III B.Sc-BZC (Zoology): Semester V (w.e.f-2022-23)
Skill Enhancement course (*As per APSCHE and CBCS Pattern Semester System*)
 - B. I B.Sc-ATZC (Zoology & Aquaculture): Semester I & II (2022-2023)
2. Approval of the stipulated Credits, Work Load, Internal Marks breakup etc...

The Chairperson of the Board of Studies welcomed the members and initiated discussion on the Agenda. He appraised 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 III.B.Sc BZC Zoology subject **Skill Enhancement course** (*As per APSCHE and CBCS Pattern Semester System* for Semester V as per the new syllabus proposed by APSCHE and CBCS Pattern Semester System with effect from 2022-23.
2. Resolved to approve the syllabus for I B.Sc-ATZC Zoology and Aquaculture Technology subjects for Semester I and II (2022-23)
3. Resolved to adopt the same syllabus as approved in the previous BOS for I & II B.Sc-BZC Zoology subject for Semester I, II, III & IV without any modifications
4. Resolved to adopt the same syllabus as approved in the previous BOS for I & II B.Sc Skill Development Courses- Paper Title-Dairy Technology for semester-II and Poultry farming for semester III as per the new syllabus APSCHE and CBCS Pattern Semester System with effect from 2021-22.
5. Resolved to send III B.Sc students for Internship in semester-VI at field/industry/training Centre as per the directions of APSCHE and CCE directions
6. Resolved to approve the Model Question paper, Blue Print and Question Bank for the above approved syllabus.

7. 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)

8. Resolved to approve the division of Internal 40 Marks to evaluate Internal Assessment as

a. Internals (1 & 2) : 20+15 marks

b. Assignments : 5 marks

c. Seminar /Group Discussion / Role play / Quizzes / Presentations : 5 marks

d. Cleaning, Greening and Attendance : 5 marks

Total – 50 marks; scaled down to 40 marks

9. The pass mark is 40% i.e., 24 out of 60 for External and 16 out of 40 for Internal.

10. 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.

11. Resolved to approve the division of Internal 25 Marks as Assessment for 10 marks, Record for 10 marks, Field note book for 5 marks

12. The pass mark is 40% i.e., 10 out of 25 for each External and Internal.

13. Resolved to approve the skill development courses evaluation for 50 marks at the end of the semesters, The pass mark to be 40% i.e., 20 marks out of 50 marks.

14. Resolved to conduct Bridge Course for one week to the newly joined first year students.

15. Resolved to use Virtual class room, ICT, Computer/Internet assisted learning for students regularly for teaching learning process.

16. Resolved to conduct student centric activities like Quiz, Group discussion etc

17. Resolved to arrange Field trips Surveys, Society outreach programmes etc.

18. Resolved to conduct Guest Lectures, Student Seminars, Study Projects etc

19. Resolved to give Assignments in the form of Critical, Innovative, Text book and Internet based.

20. Resolved to use Learning Management System LMS developed by CCE, AP

21. Resolved to advise the entire Faculty to apply for financial assistance to conduct Seminars/Workshops/Conferences /MRP's, etc.,

22. Resolved to approve the list of paper setters and examiners submitted by the department

23. Resolved to approve certificate course in vermicomposting.

24. Resolved to **Delete** the following topics-

- a. New ATZC course Semester –I, Aquaculture Paper-I, Unit-I -Aquaculture versus Agriculture; Present day needs with special reference to Andhra Pradesh
- b. New ATZC course Semester –II, Aquaculture Paper-II, Unit II length frequency Method, age composition, age-length keys, absolute and specific growth, back Calculation of length and growth, annual survival rate, asymptomatic length, fitting of growth curve.
- c. New ATZC course Semester –II, Aquaculture Paper-II, Unit III Breeding in oysters, mussels, clams, pila, freshwater mussel and cephalopods
- d. New ATZC course Semester –II, Aquaculture Paper-II, Unit-IV Embryonic and larval development of crabs and molluscs of commercial importance

25. Resolved to include the following **Additional Inputs** –

- a. Semester-V, Zoology paper 6A, Unit-I, Introduction to sustainable aquaculture
- b. Semester-V, Zoology paper 7A, Unit-III- value added fish products
- c. New ATZC course Semester –I, Zoology Paper-I, Unit-I-Eight deadly diseases in human history
- d. New ATZC course Semester –I, Zoology Paper-I, Unit-VI-Apiculture
- e. New ATZC course Semester –II, Zoology Paper-II, Unit-III-ecological importance of reptiles and amphibians
- f. New ATZC course Semester –II, Zoology Paper-II, Unit-V-structural and functional adaptations of mammals

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY
Skill Enhancement Courses (SECs) for Semester V, from 2022-23

Structure of SECs for Semester–V
(To choose one pair from the four alternate pairs of SECs)

Course Number	Name of Course	Hours/Week Theory +Practical	Credits Theory+ Practical
6&7			
6A	SUSTAINABLE AQUACULTURE MANAGEMENT	3+3	3+2
7A	POST HARVEST TECHNOLOGY OF FISH AND FISHERIES	3+3	3+2

OR

6B	LIVE STOCK MANAGEMENT-I (BIOLOGY OF DAIRY ANIMALS)	3+3	3+2
7B	LIVE STOCK MANAGEMENT -II (DAIRY PRODUCTION AND MANAGEMENT)	3+3	3+2

OR

6C	POULTRY MANAGEMENT- I (POULTRY FARMING)	3+3	3+2
7C	POULTRY MANAGEMENT- II (POULTRY PRODUCTION AND MANGEMENT)	3+3	3+2

OR

6D	SERI CULTURE -I***	3+3	3+2
7D	SERI CULTURE -II	3+3	3+2

***It is resolved to choose 6A & 7A as SEC for semester-V**

Note: For Semester–V, for the domain subject Zoology, any one of the four pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C or 6D & 7D. The pair shall not be broken (ABCD allotment is random, not on any priority basis).

Note-2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the skills embedded in syllabus citing related real field situations

Theory syllabus

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY
III B. Sc BZC
Semester-V from 2022-23
ZOOLOGY PAPER – 6A
SUSTAINABLE AQUACULTURE MANAGEMENT

Unit: 1

- 1.1 Present status of Aquaculture – Global and National scenario
- 1.2 Major cultivable species for aquaculture: freshwater, brackish water and marine.
- 1.3 Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.

Additional input: Introduction to sustainable aquaculture

Unit: 2

- 2.1 Functional classification of ponds – head pond, hatchery, nursery ponds
- 2.2 Functional classification of ponds -rearing, production, stocking and quarantine ponds
- 2.3 Physico-chemical conditions of soil and water optimum for culture (Temperature, depth, turbidity, light, water, PH, BOD, CO₂ and nutrients)

Unit: 3

- 3.1. Induced breeding in fishes
- 3.2. Culture of Indian major carps: Pre-stocking management (Dewatering, drying, ploughing/desilting; Predators, weeds and algal blooms and their control, Liming and fertilization)
- 3.3. Culture of Indian major carps - Stocking management
- 3.4. Culture of Indian major carps - post-stocking management

Unit: 4

- 4.1 Commercial importance of shrimp & prawn
- 4.2 Macrobrachium rosenbergii- biology, seed production.
- 4.3 Culture of L. vannamei – hatchery technology and culture practices
- 4.4 Mixed culture of fish and prawns

Unit: 5

- 5.1 Viral diseases of Fin Fish & shell fish
- 5.2 Fungal diseases of Fin & Shell fish
- 5.3 Bacterial diseases of Finfish & Shell fish
- 5.4 Prophylaxis in aquaculture

References:

1. Pillay TVR & M.A.Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London
2. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & Sons Inc.1981
3. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company.
4. Bose AN et.al. 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt. Ltd.

Web Links:

1. http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6708e/x670_8e06.htm
 2. http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf 3.
- https://www.notesonzooology.com/india/fishery/fish-diseases-symptoms-and-control/fishery/871_Course6

Practical syllabus

**SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY**

III B. Sc BZC

Semester-V from 2022-23

ZOOLOGY PAPER – 6A

SUSTAINABLE AQUACULTURE MANAGEMENT

Practical (Laboratory) Syllabus:

1. Fresh water Cultivable species any (Fin & Shell Fish Specimens – Observation of morphological characters by observation and drawings)
2. Brackish water cultivable species (Fin & Shell fish- Specimens- Observation of Morphological Character by observing drawing)
3. Hands on training on the use of kits for determination of water quality in aquaculture (DO, Salinity, pH, Turbidity- Testing kits to be used for the estimation of various parameters/ Standard procedure can be demonstrated for the same)
4. Demonstration of Hypophysation (Procedure of hypophysation to be demonstrated in the practical lab with any edible fish as model)
5. Viral diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of viral pathogens in fin/ shell fish – one edible specimen can be used for observation of same in the laboratory)
6. Bacterial diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)
7. Fungal diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)

Lab References

1. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company
2. http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6708e/x6708e06.htm
3. http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf
4. <https://www.notesonzooology.com/india/fishery/fish-diseases-symptoms-and-controlfishery/871> Web resources suggested by the teacher concerned and the college librarian including reading material

Theory marks allotment

**SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY
III B. Sc BZC
Semester-V from 2022-23
ZOOLOGY PAPER – 6A
SUSTAINABLE AQUACULTURE MANAGEMENT**

Theory- Internal

Total Marks: 40

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

**Theory- External
Marks: 60**

Total

Section –A

Short Answer questions 1 to 10 (Any 5 from given 10) 5×4=20

Section –B

Essay Questions 11 to 15 (With internal choice) 5×8=40

Total – 60 Marks

Practical marks allotment

**SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY
III B. Sc BZC
Semester-V from 2022-23
ZOOLOGY PAPER – 6A
SUSTAINABLE AQUACULTURE MANAGEMENT**

Practical's – External:

Time: 2 hrs.

Total Marks: 25

- | | |
|---|-----------|
| 1. Major Experiment | : 8 marks |
| 2. Minor experiment | : 4 marks |
| 3. Identification of specimens / diseases (2) – slides/pictures | : 8 marks |
| 4. viva voce | : 5 marks |

Practical's – Internal :

Total Marks: 25

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

Question Paper Blue Print

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY
III B. Sc BZC
Semester-V from 2022-23
ZOOLOGY PAPER – 6A
SUSTAINABLE AQUACULTURE MANAGEMENT

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

60 Marks

	Section A Short Questions			Section B 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 GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY
III B. Sc BZC
Semester-V from 2022-23
ZOOLOGY PAPER – 6A
SUSTAINABLE AQUACULTURE MANAGEMENT

SECTION – A

Answer any FIVE of the following
Draw diagrams wherever necessary

5 x 4 = 20

1. Traditional culture
2. Intensive culture
3. Hatching
4. Fertilization of pond
5. Liming
6. Algal blooms
7. Mixed culture (polyculture)
8. Fungal diseases

SECTION –B

Answer any FIVE of the following
Draw diagrams wherever necessary

5 x 8 = 40

9. a. What is aquaculture? Explain the current status of aquaculture at global and national level
Or
b. Explain the design and construction of fish farm
10. a. Explain the functional classification of ponds
Or
b. Explain the physicochemical conditions required for fish culture
11. a. Explain induced breeding in fishes
Or
b. Explain pre stocking management of Indian major carps
12. a. Explain the culture of *Macrobrachium rosenbergii*
Or
b. Explain the culture of *Litopenaeus vannamei*
13.a. Explain the viral diseases of finfish and shellfish
Or
b. Explain the bacterial diseases of finfish and shellfish

Theory syllabus

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY

III B. Sc BZC

Semester-V from 2022-23

ZOOLOGY PAPER – 7A

POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES

Unit – I Handling and Principles of fish Preservation

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.

1.2 Principles of preservation – cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to low radiation of gamma rays.

Unit – II Methods of fish Preservation

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

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

Unit – III Processing and preservation of fish and fish by-products

3.1 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.

3.2 Fish by-products – fish glue, Using glass, chitosan, pearl essence, shark fins, fish Leather and fish maws.

Additional Input: Value added fish products

Unit – IV Sanitation and Quality control

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

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

Unit – V Quality Assurance, Management and Certification

5.1. 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.

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

References:

1. Santharam R, N Sukumaran and P Natarajan 1987. A manual of aquaculture, Oxford- IBH, NewDelhi
2. Lakshmi Prasad's, Fish Processing Technology 2012, Arjun Publishing House
3. Dr Sunitha Rai, Fish Processing Technology, 2015, Random Publications
4. Safety and Quality Issues in Fish Processing (Woodhead Publishing Series in Food Science, Technology and Nutrition)by H A Bremner
5. K.A Mahanthy, Innovations in Fishing and Fish Processing Technologies, January 2021 Web

Resources:

1. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=145743>
2. https://ecourses.icar.gov.in/e-Learningdownload3_new.aspx?Degree_Id=03

Practical syllabus

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY
B Voc., COURSE IN AQUACULTURE TECHNOLOGY (w. e. f – 2021-22)
III B. Sc BZC
Semester-V from 2022-23
ZOOLOGY PAPER – 7A
POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES

Practical (Laboratory) Syllabus:

1. Evaluation of fish/ fishery products for organoleptic, chemical and microbial quality.
2. Preparation of dried, cured and fermented fish products for detailed procedure method visit sites:
3. Examination of salt, protein, moisture in dried / cured products
4. Examination of spoilage of dried / cured fish products, marinades, pickles, sauce.
5. Preparation of isinglass, collagen and chitosan from shrimp and crab shell.
6. Developing flow charts and exercises in identification of hazards – preparation of hazard analysis worksheet
7. Corrective action procedures in processing of fish- flow chart- work sheet preparation (** Refer the following web sites for complete procedure method and estimations of above listed practicals)

References:

1. Dr Sunitha Rai, Fish Processing Technology, 2015, Random Publications
 2. https://ecourses.icar.gov.in/e-Learning/download3_new.aspx?Degree_Id=03
 3. <https://vikaspedia.in/agriculture/fisheries/post-harvest-and-marketing/processing-infisheries/fermented-products>
 4. <https://krishi.icar.gov.in/jspui/bitstream/123456789/20500/1/Fermentation%20technology%20for%20fish.pdf>
 5. <http://jebas.org/00200620122014/Abujam%20et%20al%20JEBAS.pdf>
 6. https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual_Hygienic%20drying%20and%20packing%20of%20fish.pdf
 7. https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual_Hygienic%20drying%20and%20packing%20of%20fish.pdf
 8. https://agritech.tnau.ac.in/fishery/fish_byproducts.html
 9. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5352841/>
 10. <http://www.fao.org/3/i1136e/i1136e.pdf>
 11. <http://www.fao.org/3/x5989e/X5989e01.htm#What%20is%20sensory%20assessment>)
- Web resources suggested by the teacher concerned and the college librarian including reading material

Theory marks allotment

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY
B Voc., COURSE IN AQUACULTURE TECHNOLOGY (w. e. f – 2021-22)
III B. Sc BZC
Semester-V from 2022-23
ZOOLOGY PAPER – 7A
POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES

Theory- Internal

Total Marks: 40

- | | |
|------------------------------|------------|
| 1. Internals (2) Best of Two | : 10 marks |
| 2. Project | : 10 marks |
| 2. Assignment | : 10marks |
| 3. Seminar | : 5 marks |
| 4. Viva voce | : 5marks |

Theory- External

Total Marks: 60

Section –A

Short Answer questions 1 to 10 (Any 5 from given 10) 5×4=20

Section –B

Essay Questions 11 to 15 (With internal choice) 5×8=40

Total – 60 marks

Practical marks allotment

**SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY
III B. Sc BZC
Semester-V from 2022-23
ZOOLOGY PAPER – 7A
POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES**

Practical's – External:

Time: 2 hrs.

Total Marks: 25

- | | |
|---|-----------|
| 1. Major Experiment | : 8 marks |
| 2. Minor experiment | : 4 marks |
| 3. Identification of specimens / diseases (2) – slides/pictures | : 8 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 GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA

DEPARTMENT OF ZOOLOGY

III B. Sc BZC

Semester-V from 2022-23

ZOOLOGY PAPER – 7A

POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

60 Marks

	Section A Short Questions			Section B 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

Model Question Paper

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
DEPARTMENT OF ZOOLOGY
III B. Sc BZC
Semester-V from 2022-23
ZOOLOGY PAPER – 7A
POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES

SECTION – A

Answer any FIVE of the following
Draw diagrams wherever necessary

5 x 4 = 20

1. Transport of fresh fish
2. Rigor mortis
3. Pickling
4. Accelerated freeze drying
5. Fish meal
6. Isinglass
7. Control during processing
8. Sanitation in processing plant
9. GMP
10. Codex alimentarius

SECTION – B

Answer any FIVE of the following
Draw diagrams wherever necessary

5 x 8 = 40

11. a. Explain spoilage and factors contributing to spoilage in marine and freshwater fish
Or
b. Explain the principles of fish preservation
12. a. Explain various traditional methods of preservation
Or
b. Explain various advanced methods of fish preservation
13. a. Explain various fish products
Or
b. Explain various fish by-products
14. a. Explain the maintenance of environmental hygiene in processing plants
Or
b. Explain the maintenance of personal hygiene in processing plants
15. a. Explain the concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety
Or
b. Explain ISO 9000: 2000 series of Quality Assurance System of seafood.

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
AQUACULTURE TECHNOLOGY SYLLABUS (w.e.f -2022-23)
SEMESTER-I
PAPER – I
BASIC PRINCIPLES OF AQUACULTURE

Periods: 60

Max.marks: 100

Course outcomes:

By the completion of the course the graduate should be able to-

- CO1 Understand the history of aquaculture and its status in different countries with special emphasis in India and Andhra Pradesh. Describe the selection criteria of species for culture.
- CO2 Describe different culture systems that are followed in aquaculture.
- CO3 Describe the importance of Water, Soil characteristics in aquaculture and their role in productivity of the pond.
- CO4 Describe the design and construction of fish and shrimp farms
- CO5 Describe about Pre stocking, Stocking and Post stocking management for feeding and disease control.

Learning objectives:

1. To understand the aquaculture basics, history of aquaculture and its status in the different countries in the world with special emphasis in India and Andhra Pradesh. How to select the species for culture.
2. To understand about the different culture practicing systems that is followed in aquaculture.
3. To understand the characteristic properties of Water, Soil and their role in increasing the productivity of the pond.
4. Enable the student to design and construct the fish or shrimp farms on their own.
5. To understand the Pre stocking, Stocking and Post stocking management practices that are followed for feeding and disease control.

UNIT-I: INTRODUCTION

1-1 Concept of Blue Revolution - History and definition of Aquaculture

1-2 Scope of Aquaculture at global Level, India and Andhra Pradesh

1-3 Fresh water aquaculture, brackish water aquaculture and mariculture

1-4 Different Aquaculture systems – Pond, Cage, Pen, Running water, Extensive, Intensive and Semi-Intensive Systems and their significance. Monoculture, Polyculture and Monosex culture systems

UNIT-II: POND ECOSYSTEM

- 2-1 General Concepts of Ecology, Carrying Capacity and Food Chains
- 2-2 Lotic and lentic systems, streams and springs
- 2-2 Nutrient Cycles in Culture Ponds – Phosphorus, Carbon and Nitrogen
- 2-3 Importance of Plankton and Benthos in culture ponds, nutrient dynamics and algal blooms
- 2-4 Concepts of Productivity, estimation and improvement

UNIT-III: TYPES OF FISH PONDS

- 3-1 Classification of ponds based on water resources – spring, rain water, flood water, well water and water course ponds
- 3-2 Functional classification of ponds – head pond, hatchery, nursery, rearing, production, stocking and quarantine ponds
- 3-3 Hatchery design

UNIT- IV: POND PREPARATION

- 4-1 Important factors in the construction of an ideal fish pond – site selection, topography, nature of the soil, water resources
- 4-2 Lay out and arrangements of ponds in a fish farm
- 4-3 Construction of an ideal fish pond – space allocation, structure and components of barrage pond

UNIT-V: POND MANAGEMENT FACTORS

- 5-1** Need of fertilizer and manure application in culture ponds; Role of nutrients; NPK contents of different fertilizers and manures used in aquaculture; and precautions in their application
- 5-2** Physico-chemical conditions of soil and water optimum for culture –temperature, depth, turbidity, light, water and shore currents, PH, DOD, CO₂ and nutrients; measures to increase oxygen and reduce ammonia & hydrogen sulphide in culture ponds; correction of PH
- 5-3** Eradication of predators and weed control – advantages and disadvantages of weed, weed plants in culture ponds, aquatic weeds, weed fish, toxins used for weed control and control of predators

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
AQUACULTURE TECHNOLOGY PRACTICAL SYLLABUS (w.e.f -2022-23)

SEMESTER-I

PAPER – I

BASIC PRINCIPLES OF AQUACULTURE

Periods: 24

Max. Marks: 50

1. Estimation of Carbonates, Bicarbonates in water samples
2. Estimation of Chlorides in water samples
3. Estimation of dissolved oxygen
4. Estimation of ammonia in water
5. Field visit to nursery, rearing and stocking ponds of aqua farms
6. Field visit to hatchery
7. Study of algal blooms and their control
8. Collection & identification of zooplankton and phytoplankton
9. Study of aeration devices
10. Determination of soil nitrogen and phosphorus
11. Collection and study of aquatic weeds
12. Field survey of nearby habitat for dietary dependency on and requirement of aquaproducts

Laboratory record work with 8 to 10 experiments shall be submitted at the time of practical examination

PRESCRIBED BOOK(S):

1. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi
2. Pillay TVR, 1996. Aquaculture Principles and Practices, Fishing News Books Ltd., London

REFERENCES:

1. Pillay TVR & M.A.Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London
2. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & Sons Inc. 1981
3. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company.
4. Bose AN et.al., 1991. Coastal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt.Ltd.

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY (w.e.f -2022-23)

INTERNAL MARKS ALLOTMENT

SEMESTER-I

PAPER – I

BASIC PRINCIPLES OF AQUACULTURE

Theory- Internal

Total Marks: 40

- | | |
|--|---------------|
| 1. Internals (1 & 2) | : 20+15 marks |
| 2. Assignments | : 5 marks |
| 3. Seminar /Group Discussion / Role play / Quizzes / Presentations | : 5 marks |
| 4. Cleaning, Greening and Attendance | : 5 marks |

Total – 50 marks; scaled down to 40 marks

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY (w.e.f -2022-23)

EXTERNAL MARKS ALLOTMENT

SEMESTER-I

PAPER – I

BASIC PRINCIPLES OF AQUACULTURE

Aquaculture :Theory- External

Total Marks: 60

Section –A

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

Section –B

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

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY (w.e.f -2022-23)

PRACTICAL MARKS ALLOTMENT

SEMESTER-I

PAPER – I

BASIC PRINCIPLES OF AQUACULTURE

Practical's – External:

Time: 3 hrs.

Total Marks: 25

- | | |
|---|-----------|
| 1. Major Experiment | : 8 marks |
| 2. Minor experiment | : 4 marks |
| 3. Identification of specimens / diseases (2) – slides/pictures | : 8 marks |
| 4. viva voce | : 5 marks |

Practical's – Internal :

Total Marks: 25

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

Question Paper Blue Print

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

I B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY(w.e.f -2022-23)

SEMESTER-I

PAPER – I

BASIC 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.

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.
I B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY (w.e.f -2022-23)**

SEMESTER-I

PAPER – I

BASIC PRINCIPLES OF AQUACULTURE

Time: 3 hrs

Max Marks: 60

SECTION-A

I. Answer any FIVE of the following

Draw labeled diagram wherever necessary

5x4=20

1. Monoculture
2. Brackish water culture
3. Lotic system
4. Phosphorus cycle
5. Nursery pond
6. Flood water
7. Barrage pond
8. Topography
9. Weed fish
10. B.O.D.

SECTION-B

II. Answer any FIVE of the following

Draw labeled diagram wherever necessary

5x8=40

11. a. Explain Fresh water aquaculture
(or)
b. Explain Intensive and Semi-Intensive aquaculture.
12. a. Explain Carbon cycle
(or)
b. Describe the importance of plankton and Benthos in culture ponds .
13. a. Explain different types of ponds in aquaculture.
(or)
b. Describe how to design Hatchery .
14. a. Which important factors are involved to construct an ideal fish pond.
(or)
b. Explain the components of barrage pond.
15. a. Explain chemical factors effect in aquaculture.
(or)
b. write about weed control in aquaculture.

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
AQUACULTURE TECHNOLOGY SYLLABUS (w.e.f -2022-23)
SEMESTER-II
PAPER – II
BIOLOGY OF FIN FISH & SHELL FISH

Periods: 60

Max. Marks: 100

Course outcomes:

By the completion of the course the graduate should be able to-

- **CO1** Describe the external morphology of different cultivable aquatic organisms and should be able to differentiate the variations externally.
- **CO2** Describe the internal body organisation and obtained valuable skills in fish anatomy and physiology including regulatory mechanisms in teleost fish and prawn.
- **CO3** Estimate the qualitative and quantitative food consumption and feeding strategies
- **CO4** Describe different methods to estimate and identify the age and growth of fish.
- **CO5** Describe the types of reproduction, Sex related differentiation, maturity stages and the causes of fecundity.

Learning objectives:

1. To identify and understand the variations by studying external morphology of Fish, Prawn, Crab and Bivalve.
2. To study the organisation and understand the structure of internal organs in fish and prawn.
3. To study about the feed given to the cultured organism qualitatively and quantitatively and gain knowledge about different feeding strategies that are followed in aquaculture.
4. To identify the age of the fish and to estimate the growth of the fish by different methods.
5. To know about the different types of reproduction, identify the sexual difference and stages involved till sexual maturity. Understand the causes and reasons for fecundity.

UNIT-I: GENERAL CHARACTERS & CLASSIFICATION OF CULTIVABLE FIN & SHELL FISH

1-1 General Characters and classification of fishes, crustaceans and molluscs up to the level of Class.

1-2 Fish, Crustaceans and Molluscs of commercial importance

1-3 Sense organs of fishes, crustaceans and molluscs

1-4 Specialized organs in fishes – electric organ, venom and toxins

1-5 Buoyancy in fishes- swim bladder and mechanism of gas secretion

UNIT-II: FOOD, FEEDING AND GROWTH

2-1 Natural fish food, feeding habits, feeding intensity, stimuli for feeding, utilization of food, gut content analysis, structural modifications in relation to feeding habits, forage ratio and food selectivity index

2-2 Principles of Age and growth determination; growth regulation, Growth rate measurement – scale method, otolith method, skeletal parts as age indicators

2-3 Genetic, biotic & ecological factors in determining the longevity of fishes

2-4 Length-weight relationship, condition factor/Ponderal index, relative condition factor

UNIT-III: REPRODUCTIVE BIOLOGY

3-1 Breeding in fishes, breeding places, breeding habits & places, breeding in natural environment and in artificial ponds, courtship and reproductive cycles

3-2 Induced breeding in fishes

3-4 Breeding in shrimp and pearl oyster.

UNIT – IV: DEVELOPMENT

4-1 Parental care in fishes, ovo-viviparity, oviparity, viviparity, nest building and brooding

4-2 Embryonic and larval development of fishes and shrimp

4-3 Environmental factors affecting reproduction and development of cultivable aquatic fin & shell fish

UNIT-V: HORMONES & GROWTH

5-1 Endocrine system in fishes

5-2 Neurosecretary cells, androgenic gland, ovary, Y-organ, chromatophores, pericardial glands and cuticle.

5-3 Molting, molting stages, metamorphosis in crustacean shell fish

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
AQUACULTURE TECHNOLOGY PRACTICAL SYLLABUS (w.e.f -2022-23)
SEMESTER-II
PAPER – II
BIOLOGY OF FIN FISH & SHELL FISH

Periods: 24

Max. Marks: 50

1. Study of mouth parts in herbivorous and carnivorous fishes
2. Comparative study of digestive system of herbivorous and carnivorous fishes
3. Length-weight relationship of fishes
4. Gut content analysis in fishes and shrimp
5. Mouth parts and appendages of cultivable prawns, shrimps and other crustaceans
6. Study of eggs of fishes, shrimps, prawns and other crustaceans
7. Study of oyster eggs
8. Embryonic and larval development of fish
9. Study of gonadal maturity and fecundity in fishes and shellfish
10. Observation of crustacean larvae
11. Observation of molluscan larvae
12. Study of nest building and brooding of fishes

Laboratory record work with 8 to 10 experiments shall be submitted at the time of practical examination

PRESCRIBED BOOK(S):

1. Bone Q et al., 1995. Biology of fishes, Blackie academic & professional, LONDON
2. Saxena AB 1996. Life of Crustaceans. Anmol Publications Pvt.Ltd., New Delhi

REFERENCES:

1. Tandon KK & Johal MS 1996. Age and Growth in Indian Fresh Water Fishes. Narendra Publishing House, New Delhi.
2. Raymond T et al., 1990. Crustacean Sexual Biology, Columbia University Press, New York
3. Guiland J.A (ed) 1984. Penaeid shrimps- Their Biology and Management.
4. Barrington FJW 1971. Invertebrates: Structure and Function.ELBS
5. Parker F & Haswell 1992. The text book of Zoology, Voll. Invertebrates (eds. Marshal AJ & Williams). ELBS & Mc Millan & Co.

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY (w.e.f -2022-23)

INTERNAL MARKS ALLOTMENT

SEMESTER-II

PAPER – II

BIOLOGY OF FIN FISH & SHELL FISH

Theory- Internal

Total Marks: 40

- | | |
|--|---------------|
| 1. Internals (1 & 2) | : 20+15 marks |
| 2. Assignments | : 5 marks |
| 3. Seminar /Group Discussion / Role play / Quizzes / Presentations | : 5 marks |
| 4. Cleaning, Greening and Attendance | : 5 marks |

Total – 50 marks; scaled down to 40 marks

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY (w.e.f -2022-23)

EXTERNAL MARKS ALLOTMENT

SEMESTER-II

PAPER – II

BIOLOGY OF FIN FISH & SHELL FISH

Theory- External

Total Marks: 60

Section –A

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

Section –B

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

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY (w.e.f -2022-23)

PRACTICAL MARKS ALLOTMENT

SEMESTER-II

PAPER – II

BIOLOGY OF FIN FISH & SHELL FISH

Practical's – External:

Time: 2 hrs.

Total Marks: 25

- | | |
|---|-----------|
| 1. Major Experiment | : 8 marks |
| 2. Minor experiment | : 4 marks |
| 3. Identification of specimens / diseases (2) – slides/pictures | : 8 marks |
| 4. viva voce | : 5 marks |

Practical's – Internal :

Total Marks: 25

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

Question Paper Blue Print

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

I B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY (w.e.f -2022-23)

SEMESTER-II

PAPER – II

BIOLOGY OF FIN FISH & SHELL FISH

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 Question Paper

**SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY (w.e.f -2022-23)
SEMESTER-II
PAPER – II
BIOLOGY OF FIN FISH & SHELL FISH**

Time:3 hrs

Max Marks: 60

SECTION-A

I. Answer any FIVE of the following

Draw labeled diagrams wherever necessary

5x4=20

1. Electric organs.
2. Swim bladder in fishes
3. Natural fish food
4. Length-weight relationship
5. Breeding places
6. Induced breeding
7. Nest building
8. Ovo-viviparity
9. Neurosecretary cells
10. Moulting stages.

II. Answer any FIVE of the following:

Draw labeled diagrams wherever necessary

5x8=40

11. a. Describe general characters of fishes and classify up to class level.
(or)
b. Explain fin fish and shell fish commercial importance.
12. a. Explain different methods to estimate fish age and growth
(or)
b. Explain different factors in fish longevity
13. a. Write an essay on different breeding habitats.
(or)
b. Explain Breeding in shrimp
14. a. Describe embryonic and larval development in fishes.
(or)
b. Explain environmental factors effecting on fin fish in reproduction and development.
15. a. Role of Endocrine hormones in fishes.
(or)
b. Describe metamorphosis in crustacean.

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc BZC & ATZC
ZOOLOGY SYLLABUS
(w.e.f. 2022-23)
SEMESTER I
PAPER – I: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES

HOURS:60

Max. Marks: 100

Course Outcomes:By the completion of the course the graduate should able to –

CO1:Describe general taxonomic rules on animalclassification

CO2:Classify Protozoa toCoelenterata with taxonomickeys

CO3:Classify Phylum Platyhelminthes to Annelida phylum using examples from parasitic adaptation and vermincomposting

CO4:Describe Phylum Arthropoda to Mollusca using examples and importance of insects andMolluscans

CO5:Describe Echinodermata to Hemichordata with suitable examples and larval stages in relation to the phylogeny

Learning objectives:

1. To understand the taxonomic position of protozoa tohelminthes.
2. To understand the general characteristics of animals belonging to protozoa to hemichordata.
3. To understand the structural organization of animals phylum from protozoa to hemichordata.
4. To understand the origin and evolutionary relationship of different phyla from protozoa tohemichordata.
5. To understand the origin and evolutionary relationship of different phylum from annelids tohemichordates.

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc BZC & ATZC
ZOOLOGY SYLLABUS
(w.e.f. 2022-23)
SEMESTER I
PAPER – I: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES

HOURS:60

Max. Marks: 100

UNIT I

- 1.1 Principles of Taxonomy – Binomial nomenclature – Rules of nomenclature
- 1.2 Whittaker's five kingdom concept and classification of Animal Kingdom.

Phylum Protozoa

- 1.3 General Characters and classification of protozoa up to classes with suitable examples
- 1.4 Locomotion, nutrition and reproduction in Protozoans
- 1.5 *Elphidium* (type study)

- **Additional Input:** 8 Deadly Diseases in Human History
(Corona, Ebola, Dengue, Hantavirus, Meningitis, SARS, Influenza, Bird Flu)

UNIT –II

Phylum Porifera

- 2.1 General characters and classification up to classes with suitable examples
- 2.2 Skeleton in Sponges
- 2.3 Canal system in sponges

Phylum Coelenterata

- 2.4 General characters and classification up to classes with suitable examples
- 2.5 Metagenesis in *Obelia*
- 2.6 Polymorphism in coelenterates
- 2.7 Corals and coral reefs

Phylum Ctenophora :

- 2.8 General Characters and Evolutionary significance (affinities)

Unit – III

Phylum Platyhelminthes

- 3.1 General characters and classification up to classes with suitable examples
- 3.2 Life cycle and pathogenicity of *Fasciola hepatica*
- 3.3 Parasitic Adaptations in helminthes

Phylum Nematelminthes

- 3.4 General characters and classification up to classes with suitable examples
- 3.5 Life cycle and pathogenicity of *Ascaris lumbricoides*

Unit – IV

Phylum Annelida

- 4.1 General characters and classification up to classes with suitable examples
- 4.2 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

Phylum Arthropoda

- 4.4 General characters and classification up to classes with suitable examples
- 4.5 Vision and respiration in Arthropoda
- 4.6 Metamorphosis in Insects
- 4.7 *Peripatus*- Structure and affinities
- 4.8 Social Life in Bees and Termites

➤ **Additional Input:** Apiculture

Unit – V

Phylum Mollusca

- 5.1 General characters and classification up to classes with suitable examples
- 5.2 Pearl formation in Pelecypoda
- 5.3 Sense organs in Mollusca

Phylum Echinodermata

- 5.4 General characters and classification up to classes with suitable examples
- 5.5 Water vascular system in starfish
- 5.6 Larval forms of Echinodermata

Phylum Hemichordata

- 5.7 General characters and classification up to classes with suitable examples
- 5.8 *Balanoglossus*- Structure and affinities

Co-curricular activities (suggested)

- Preparation of chart/model of phylogenetic tree of life, 5-kingdom classification, *Elphidium* life cycle etc.
- Visit to Zoology museum or Coral island as part of Zoological tour
- Charts on life cycle of *Obelia*, polymorphism, spongespicules
- Clay models of canal system in sponges
- Preparation of charts on life cycles of *Fasciola* and *Ascaris*
- Visit to adopted village and conducting awareness campaign on diseases, to people as part of Social Responsibility.
- Plaster-of-paris or Thermocol model of *Peripatus*
- Construction of a vermicompost in each college, manufacture of manure by students and donating to local farmers
- Models of compound eye, bee hive and termitarium (termitaria) by students
- Visit to apiculture centre and short-term training as part of apprenticeship programme of the govt. Of Andhra Pradesh
- Chart on pearl forming layers using clay or Thermocol
- Visit to a pearl culture rearing industry/institute
- Live model of water vascular system
- Phylogeny chart on echinoderm larvae and their evolutionary significance
- Preparation of charts depicting the feeding mechanism, 3 coeloms, tornaria larva etc., of *Balanoglossus*

REFERENCE BOOKS

1. **L.H. Hyman** 'The Invertebrates' Vol I, II and V. – M.C. Graw Hill Company Ltd.
2. **Kotpal, R.L.** 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
3. **E.L. Jordan and P.S. Verma** 'Invertebrate Zoology' S. Chand and Company.
4. **R.D. Barnes** 'Invertebrate Zoology' by: W.B. Saunders CO., 1986.
5. **Barrington. E.J.W.**, 'Invertebrate structure and Function' by ELBS.
6. **P.S. Dhami and J.K. Dhami.** Invertebrate Zoology. S. Chand and Co. New Delhi.
7. **Parker, T.J. and Haswell** 'A text book of Zoology' by, W.A., Mac Millan Co. London.
8. **Barnes, R.D. (1982).** Invertebrate Zoology, 6th Edition"

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

I B.Sc BZC & ATZC

ZOOLOGY PRACTICAL SYLLABUS

SEMESTER-I

PAPER – I

ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

Periods:24 Max. Marks: 50

Learning Outcomes:

1. To understand the importance of preservation of museum specimens
2. To identify animals based on special identifying characters
3. To understand different organ systems through demo or virtual dissections
4. To maintain a neat, labeled record of identified museum specimens

Syllabus:

1. Study of museum slides / specimens / models (Classification of animals up to orders)

Protozoa: Amoeba, *Paramecium*, *Paramecium* Binary fission and Conjugation, *Vorticella*, *Entamoeba histolytica*, *Plasmodium vivax*

Porifera: *Sycon*, *Spongilla*, *Euspongia*, *Sycon*- T.S & L.S, Spicules, Gemmule
Coelenterata: *Obelia* – Colony & *Medusa*, *Aurelia*, *Physalia*, *Velella*, *Corallium*, *Gorgonia*, *Pennatulav.*

Platyhelminthes: *Planaria*, *Fasciola hepatica*, *Fasciola* larval forms – Miracidium, Redia, Cercaria, *Echinococcus granulosus*, *Taenia solium*, *Schistosoma haematobium* vii.

Nemathelminthes: *Ascaris* (Male & Female), *Dracunculus*, *Ancylostoma*, *Wuchereria*

Annelida: *Nereis*, *Aphrodite*, *Chaetopterus*, *Hirudinaria*, Trochophore larva

Arthropoda: *Cancer*, *Palaemon*, *Scorpion*, *Scolopendra*, *Sacculina*, *Limulus*, *Peripatus*, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female *Anopheles* and *Culex*, Mouthparts of Housefly and Butterfly. xiii.

Mollusca: *Chiton*, *Pila*, *Unio*, *Pteredo*, *Murex*, *Sepia*, *Loligo*, *Octopus*, *Nautilus*, Glochidium larva

Echinodermata: *Asterias*, *Ophiothrix*, *Echinus*, *Clypeaster*, *Cucumaria*, *Antedon*, Bipinnaria larva

Hemichordata: *Balanoglossus*, Tornaria larva

2. Dissections:

- 1 Prawn: Appendages, Digestive system, Nervous system, Mounting of Statocyst
- 2 Insect Mouth Parts
- 3 Laboratory Record work shall be submitted at the time of practical examination
- 4 An “**Animal album**” containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose
- 5 Computer - aided techniques should be adopted or show virtual dissections

REFERENCE MANUALS:

1. Practical Zoology- Invertebrates S.S.Lal
2. Practical Zoology - Invertebrates P.S.Verma
3. Practical Zoology - Invertebrates K.P.Kurl
4. Ruppert and Barnes (2006) Invertebrate Zoology, 8th Edition, Holt Saunders International Edition

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

I B.Sc (B.Z.C & ATZC) ZOOLOGY THEORY

INTERNAL MARKS ALLOTMENT

SEMESTER-I

PAPER – I

ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

Theory- Internal

Total Marks: 40

- | | |
|--|---------------|
| 1. Internals (1 & 2) | : 20+15 marks |
| 2. Assignments | : 5 marks |
| 3. Seminar /Group Discussion / Role play / Quizzes / Presentations | : 5 marks |
| 4. Cleaning, Greening and Attendance | : 5 marks |

Total – 50 marks; scaled down to 40 marks

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

I B.Sc (B.Z.C& ATZC) ZOOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

SEMESTER-I

PAPER – I

ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

Time: 3 Hours

Total Marks: 60

Zoology Theory- External

Section –A

I. Short Answer questions 1 to 10(Any 5 from given10) 5x4=20

Section –B

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

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

I B.Sc (B.Z.C & ATZC) ZOOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-I

PAPER – I

ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

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.

I B.Sc (B.Z.C & ATZC) ZOOLOGY THEORY

SEMESTER-I

PAPER – I

ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

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

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

I B.Sc (B.Z.C & ATZC) ZOOLOGY (w.e.f -2017-18)

SEMESTER-I

PAPER – I

ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

Time: 3Hrs

Max Marks: 60

SECTION-A

I. Answer any FIVE of the following

Draw labeled diagram wherever necessary

5x4=20

1. Binomial nomenclature
2. Nutrition in Protozoa
3. General characters of ctenophore
4. Fringing Reef
5. Parasitic adaptations in Helminthes
6. General characters of Nematyhelminthes
7. Oligocheata
8. Vision in Arthropoda
9. Bipinnaria
10. Structure of Balanoglossus

SECTION-B

II. Answer any FIVE of the following

Draw labeled diagram wherever necessary

5x8=40

11. (a) Write an essay on Whittaker's five kingdom concept .
(OR)
(b). Describe the Lifecycle of Elphidium
12. (a) Explain the Canal system in Sponges.
(OR)
(b). Write an essay on Polymorphism in coelenterate.
13. (a) Describe the Lifecycle of Fasciola hepatica
(OR)
(b) Describe the Lifecycle of Enterobiusvermicularis
14. (a) Write an essay on Vermiculture
(OR)
(b). Explain the structure and affinities of Peripatus
15. (a) Explain the forsscc rppearl formation in Pelycspoda
(OR)
(b) Describe the water vascular system in starfish.

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

**I B.Sc BZC & ATZC
ZOOLOGY SYLLABUS**

(w.e.f. 2020-21)

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

HOURS :60 Max.Marks:100

Course Outcomes:

By the completion of the course the graduate should be able to -

CO1: Describe general taxonomic rules on animal classification of chordates

CO2: Classify Protochordata to Mammalia with taxonomic keys

CO3: Understand Mammals with specific structural adaptations

CO4: Understand the significance of dentition and evolutionary significance

CO5: Understand the origin and evolutionary relationship of different phyla from Protochordata to Mammalia.

Learning objectives:

1. To understand the animal kingdom.
2. To understand the taxonomic position of Protochordata to Mammalia.
3. To understand the general characteristics of animals belonging to Fishes to Reptilians.
4. To understand the body organization of Chordata.
5. To understand the taxonomic position of Protherian mammals.

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc BZC & ATZC
SEMESTER-II
PAPER – II: ANIMAL DIVERSITY – BIOLOGY OF CHORDATES
HOURS:60Max. Marks: 100

Unit - I

- 1.1 General characters and classification of Chordata upto classes
- 1.2 Protochordata- Salient features of Cephalochordata , Affinities of Cephalochordata.
- 1.3 Salient features of Urochordata
- 1.4 Structure and life history of *Herdmania*
- 1.5 Retrogressive metamorphosis –Process and Significance

Unit -II

- 2.1 Cyclostomata, General characters, Comparison of *Petromyzon* and *Myxine*
- 2.2 Pisces : General characters of Fishes
- 2.3 *Scoliodon*: External features, Digestive system, Respiratory system, Structure and function of Heart, Structure and functions of the Brain.
- 2.4 Migration in Fishes
- 2.5 Types of Scales
- 2.6 Dipnoi

Unit - III

- 3.1 General characters of Amphibia
 - 3.2 Classification of Amphibia upto orders with examples.
 - 3.3 *Rana hexadactyla*: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and functions of the Brain
 - 3.4 Reptilia: General characters of Reptilia, Classification of Reptilia upto orders with examples
 - 3.5 *Calotes*: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain
 - 3.6 Identification of Poisonous snakes
- **Additional Inputs:** Ecological importance of reptiles and amphibians

Unit - IV

- 4.1 Aves General characters of Aves
- 4.2 *Columba livia*: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain
- 4.3 Migration in Birds
- 4.4 Flight adaptation in birds

Unit - V

- 5.1 General characters of Mammalia
 - 5.2 Classification of Mammalia upto sub - classes with examples
 - 5.3 Comparison of Prototherians, Metatherians and Eutherians
 - 5.4 Dentition in mammals
- **Additional Inputs:** Structural and Functional Adaptations of Mammals

Co-curricular activities (suggested)

- Preparation of charts on Chordate classification (with representative animal photos) and retrogressive metamorphosis
- Thermocol or Clay models of Herdmania and Amphioxus
- Visit to local fish market and identification of local cartilaginous and bony fishes
- Maintaining of aquarium by students
- Thermocol model of fish heart and brain
- Preparation of slides of scales of fishes
- Visit to local/nearby river to identify migratory fishes and prepare study notes
- Preparation of Charts on above topics by students (Eg: comparative account of vertebrate heart/brain/lungs, identification of snakes etc.)
- Collecting and preparation of Museum specimens with dead frogs/snakes/lizards etc., and/or their skeletons
- Additional input on types of snake poisons and their antidotes (student activity).
- Collection of bird feathers and submission of report on Plumology
- Taxidermic preparation of dead birds for Zoology museum
- Map pointing of prototherian and metatherian mammals
- Chart preparation for dentition in mammals

REFERENCE BOOKS

1. J.Z. Young, 2006. The life of vertebrates. (The Oxford University Press, New Delhi). 646 pages. Reprinted
2. Arumugam, N. Chordate Zoology, Vol. 2. Saras Publication. 278 pages. 200 figs.
3. A.J. Marshall, 1995. Textbook of zoology, Vertebrates. (The McMillan Press Ltd., UK). 852 pages. (Revised edition of Parker & Haswell, 1961).
4. M. Ekambaranatha Ayyar, 1973. A manual of zoology. Part II. (S. Viswanathan Pvt. Ltd., Madras).
5. P.S. Dhama & J.K. Dhama, 1981. Chordate zoology. (R. Chand & Co.). 550 pages.
6. Gurdarshan Singh & H. Bhaskar, 2002. Advanced Chordate Zoology. Campus Books, 6 Vols., 1573 pp., tables, figs.
7. A.K. Sinha, S. Adhikari & B.B. Ganguly, 1978. Biology of animals. Vol. II. Chordates. (New Central Book Agency, Calcutta). 560 pages.
8. R.L. Kotpal, 2000. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut). 632 pages.
9. E.L. Jordan & P.S. Verma, 1998. Chordate zoology. (S. Chand & Co.). 1092 pages.
10. G.S. Sandhu, 2005. Objective Chordate Zoology. Campus Books, vii, 169 pp.
11. Sandhu, G.S. & H. Bhaskar, H. 2004. Textbook of Chordate Zoology. Campus Books, 2 vols., xx, 964 p., figs.
12. Veena, 2008. Lower Chordata. (Sonali Publ.), 374 p., tables, 117 figs.

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

I B.Sc BZC & ATZC

ZOOLOGY PRACTICAL SYLLABUS

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY - BIOLOGY OF CHORDATES

Periods:24 Max. Marks: 50

Learning Outcomes:

- To understand the taxidermic and other methods of preservation of chordates
- To identify chordates based on special identifying characters
- To understand internal anatomy of animals through demo or virtual dissections, thus directing the student for “empathy towards the fellow living beings”
- To maintain a neat, labeled record of identified museum specimens

OBSERVATION OF THE FOLLOWING SLIDES / SPOTTERS / MODELS

1. Protochordata : *Herdmania, Amphioxus, Amphioxus* T.S through pharynx.
2. Cyclostomata : *Petromyzon and Myxine*.
3. Pisces : *Pristis, Torpedo, Hippocoampus, Exocoetus, Echineis, Labeo, Catla, Clarius, Channa, Anguilla*.
4. Amphibia : *Ichthyophis, Amblystoma, Axolotl larva, Hyla*,
5. Reptilia: *Draco, Chamaeleon, Uromastix, Testudo, Trionyx, Russels viper, Naja, Krait, Hydrophis, Crocodile*.
6. Aves : *Psittacula, Eudynamis, Bubo, Alcedo*.
7. Mammalia: *Ornithorhynchus, Pteropus, Funambulus*.

Dissections-

1. *Scoliodon* IX and X, Cranial nerves
2. *Scoliodon* Brain
3. Mounting of fish scales

Note:

1. Dissections are to be demonstrated only by the faculty or virtual.
2. Laboratory Record work shall be submitted at the time of practical examination.

REFERENCE BOOKS:

1. S.S.Lal, Practical Zoology – Vertebrata
2. P.S.Verma, A manual of Practical Zoology – Chordata

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

I B.Sc (B.Z.C & ATZC) ZOOLOGY THEORY

INTERNAL MARKS ALLOTMENT

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

Theory- Internal

Total Marks: 40

- | | |
|--|---------------|
| 1. Internals (1 & 2) | : 20+15 marks |
| 2. Assignments | : 5 marks |
| 3. Seminar /Group Discussion / Role play / Quizzes / Presentations | : 5 marks |
| 4. Cleaning, Greening and Attendance | : 5 marks |

Total – 50 marks; scaled down to 40 marks

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

I B.Sc (B.Z.C) ZOOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

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.

I B.Sc (B.Z.C & ATZC) ZOOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY - BIOLOGY OF CHORDATES

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.

I B.Sc (B.Z.C & ATZC) ZOOLOGY THEORY

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY - BIOLOGY OF CHORDATES

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

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

I B.Sc (B.Z.C & ATZC) ZOOLOGY

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY- BIOLOGY OF CHORDATES

Time:3Hrs

Max Marks: 60

SECTION-A

I. Answer any FIVE of the following

Draw labeled diagrams wherever necessary

5x4=20

1. Structure of *Amphioxus*
2. General characters of prochordata
3. Placoid scale
4. Dipnoi
5. Apoda
6. Anapsida
7. Quill feather
8. Ratitae
9. Prototheria
10. General characters of mammals

II. Answer any FIVE of the following:

5x8=40

Draw labeled diagrams wherever necessary

11. a. Explain the life history of *Herdmania*
OR
b. Explain the general characters of chordate
12. a. Compare the characters of *Petromyzon* and *Myxine*
OR
b. Describe the structure of heart of *Scoliodon*
13. a. Describe the digestive system of *Rana hexadactyla*
OR
b. Describe the identifications of poisonous snakes
14. a. Write an essay on flight adaptations in birds
OR
b. Explain the respiratory system of *Columba livia*
15. a. Compare the characters of Metatheria and Eutheria
OR
b. Write an essay on dentition in mammals

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
DEPARTMENT OF ZOOLOGY
SKILL DEVELOPMENT COURSES
ZOOLOGY STREAM
SEMESTER-II
PAPER-SDC-III
DAIRY TECHNOLOGY
SYLLABUS
B.A/B.Com/B.Sc

(As part of skill development courses under CBCS framework with effect from 2020-2021)
(Total 30 hrs (02h/wk), 02 Credits & Max 50 Marks)

LEARNING OUTCOMES:

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

1. Understand the pre-requisites for starting a Dairy farm
2. Recognize different breeds of Cows & buffaloes following safety precautions.
3. Prepare and give recommended feed and water for livestock
4. Maintain health of livestock along with productivity
5. Vaccination of cattle, nutrients requirements
6. Entrepreneurship i.e., effectively market dairy products
7. Ensure safe and clean dairy farm and Standard safety measures to be taken in establishing an industry
8. Efficiently start and manage to establish or develop a Dairy Industry

SYLLABUS

UNIT No	TOPIC	No. of Hours
UNIT-I	Introduction and Establishment of a Dairy Farm 1.1 Dairy development in India – Dairy Cooperatives (NDRI, NDDB, TCMPPF)(1hr) 1.2 Constraints of Present Dairy Farming and Future Scope of Dairy Farmer.(1 hr) 1.3 Selection of site for dairy farm; Systems of housing – Loose housing system, Conventional Dairy Farm; Records to be maintained in a dairy farm. (2 hrs)	05
UNIT-II	Livestock Identification and Management 2.1 Breeds of Dairy Cattle and Buffaloes – Identification of Indian cattle and buffalo breeds and Exotic breeds; Methods of selection of Dairy animals. (5 hrs) 2.2 Systems of inbreeding and crossbreeding. (2 hrs) 2.3 Weaning of calf, Castration, Dehorning, Deworming and Vaccination programme (3 hrs) 2.4 Care and management of calf, heifer, milk animal, dry and pregnant animal, bulls and bullocks. (3 hrs)	13
UNIT-III	Feed Management, Dairy Management, Cleaning and Sanitation 3.1 Basic Principles of Feed, Important Feed Ingredients, Feed formulation and Feed Mixing(2 hrs)	8

	<p>3.2 Operation Flood –Definition of Milk and Nutritive value of milk and ICMR recommendation of nutrients –Per Capita Milk production and availability in India and Andhra Pradesh - Methods of Collection and Storage of Milk–Labelling and Storage of milk products (4 hrs)</p> <p>3.3 Cleaning and sanitation of dairy farm – Safety precautions to prevent accidents in an industry. (2 hrs)</p>	
<p>Co-curricular Activities suggested</p>	<p>1. Group discussion&SWOT analysis</p> <p>2. Visit to a Dairy Farm</p> <p>3. Visit to Milk Cooperative Societies</p> <p>4. Visit to Feed Milling Plants</p> <p>5. Market Study and Identification of Government Schemes, Insurance and Bank Loans in relation to dairy farming</p>	<p>4</p>

Reference books:

1. Dairy Science: Petersen (W.E.) Publisher – Lippincott & Company
2. Principles and practices of Dairy Farm –Jagdish Prasad
3. Text book of Animal Husbandry - G C Benarjee
4. Hand book of Animal Husbandry - ICAR Edition
5. Outlines of Dairy Technology – Sukumar (De) – Oxford University press
6. Indian Dairy Products – Rangappa (K.S.) & Acharya (KT) – Asia Publishing House.
7. The technology of milk Processing – Ananthkrishnan, C.P., Khan, A.Q. and Padmanabhan, P.N. – Shri Lakshmi Publications.
8. Dairy India 2007, Sixth edition
9. Economics of Milk Production – BharatiPratimaAcharya Publishers.
10. <http://www.asci-india.com/BooksPDF/Dairy%20Farmer%20or%20Entrepreneur.pdf>
11. <https://labour.gov.in/industrial-safety-health>

Question Paper Blue Print

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

**DEPARTMENT OF ZOOLOGY
SKILL DEVELOPMENT COURSES
ZOOLOGY STREAM**

SEMESTER-II

PAPER-SDC-III

DAIRY TECHNOLOGY

B.A/B.Com/B.Sc

(As part of skill development courses under CBCS framework with effect from 2020-2021)

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

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

Unit No	No of Questions	Total marks allotted
I	3	30
II	4	40
III	3	30

Section-A

Questions numbers 1 to 10 - Each question carries 10 marks

Out of 10 Questions 5 has to be answered.

Total : 50 Marks

Minimum pass mark: 20 marks

Model Paper

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
SEMESTER-II
Skill Development Course
Diary Technology

Answer **ANY FIVE** of the following questions

1. Explain two methods of systems of housing of Diary animals.
2. Explain the records to be maintained in Diary farm.
3. Explain any three breeds of Indian Diary cattle and Buffaloes.
4. Explain about Inbreeding and Cross breeding in Cattle.
5. Write about Deworming and Vaccination programs followed in Diary forms.
6. Write about care and management of calf and milk animals.
7. Explain about different methods of collection and storage of milk.
8. Give an account of feed ingredients and feed management required for diary animals.
9. Write about cleaning and sanitation of Dairy farms.
10. Explain labelling and storage of milk products.

&&&&

Question bank

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA

SEMESTER-II

SKILL DEVELOPMENT COURSE

DIARY TECHNOLOGY

UNIT-I

1. Explain two methods of systems of housing of Diary animals.
2. Write about NDRI and NDDB.
3. Explain constraints of present Diary farming.
4. Explain the records to be maintained in Diary farm.

UNIT-II

5. Explain any three breeds of Indian Diary cattle and Buffaloes.
6. Explain any three breeds of Exotic Diary cattle and Buffaloes.
7. Explain Castration and Dehorning of cattle.
8. Explain the methods of selection of Diary animals.
9. Explain about Inbreeding and Cross breeding in Cattle.
10. Write about Deworming and Vaccination programs followed in Diary forms.
11. Write about care and management of calf and milk animals.
12. Write about care and management of Bulls and Bullocks.

UNIT-III

13. Explain about different methods of collection and storage of milk.
14. Define Milk and explain the nutritive values of milk and ICMR recommendations of nutrients.
15. Give an account of feed ingredients and feed management required for diary animals.
16. Write about cleaning and sanitation of Dairy farms.
17. Explain labeling and storage of milk products.
