MANONMANIUM SUNDARANAR UNIVERSITY, TIRUNELVELI-12

B. Sc ZOOLOGY PROGRAMME
CHOICE BASED CREDIT SYSTEM – CBCS
Syllabus for Affiliated Colleges with effect from the academic year 2021- 2022 onwards
(incorporated with Learning Outcome based Curriculum Framework- LOCF)

INTRODUCTION

Outcome-Based Education is incorporated into the curriculum based on the requirements of NAAC and UGC – Quality Mandate (2018). To fulfil these requirements, the Programme Educational Objectives (PEOs), Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) and Course Outcomes (COs) were framed for all programmes in alignment with the Vision and Mission of the respective departments and in-turn with the Vision, Mission and Educational Objectives of the University.

VISION AND MISSION OF THE UNIVERSITY

VISION

" To provide quality education to reach the un-reached "

MISSION

- To conduct research, teaching and outreach programmes to improve conditions of human living.
- To create an academic environment that honours women and men of all races, caste, creed, cultures and all atmosphere that values intellectual curiosity, pursuit of knowledge , academic freedom and integrity.
- To offer a wide variety of offcampus educational and training programmes, including the use of information technology to individuals and groups.
- To develop partnership with industries and government so as to improve the quality of work place and to serve as catalyst for economic and cultural development.
- To provide quality / inclusive education especially for the rural and unreached segments of economically downtrodden students including women, socially oppressed and differently abled.

VISION AND MISSION OF THE DEPARTMENT

VISION

"To provide quality education in biology for updating knowledge and developing skills to overcome global challenges that hinders the progress of our Nation".

MISSION

Empowerment and upliftment of downtrodden and weaker section of the community through learning biology

- teaching, research and outreach programmes .
- creating an academic environment that honours all sectors of society.
- offering possible off-campus educational and training programmes using High-tech biotechnology.
- inclusive and intensive education, especially for the rural and unreached segments for the improvement of the economy of the individuals and in turn our nation.

PREAMBLE

Biology is the branch of Science which investigates the origin, structure, function and distribution of life in all its forms. Zoology is a vast subject that advances workers in the field and tends to specialize in one or more of the subdivisions in which they can hope to become very proficient. The three year programme imparts education on the diversity of animal life, development as well as their genetic structure and functions. Students can obtain career paths globally in the field of biotechnology and genetic engineering, wild life conservation, environmental management, ecosystem monitoring, animal welfare as well as human health. Zoology is an interesting subject with immense number of avenues to open up new challenges like the control and prevention of Covid 19 outbreak, bioremediation and categorizing crisis management. Also it motivates the learners to crack the opportunities worldwide and finally gain expertise in their field to become Nobel Laureates.

B.Sc., ZOOLOGY PROGRAMME

CHOICE BASED CREDIT SYSTEM – CBCS

(with effect from the academic year 2021-2022 onwards)

Sem	Part I/ II/III IV/V	Course Status	Course title	Contact Hrs/ Week	Credits	Marks				
						Maximum			Passing minimum	
						Int.	Ext	Total	Ext.	Total
I	I	Language	Tamil/Other Language	6	4	25	75	100	30	40
	II	Language	Communicative English –I	6	4	25	75	100	30	40
	III	Core	Invertebrata	4	4	25	75	100	30	40
	III	Add on Major (Mandatory)	Professional English for Life Sciences – I	4	4	25	75	100	30	40
	III	Core Practical-I	Invertebrata	2	1	50	50	100	20	40
	III	Allied	Cell Biology, Genetics & Biotechnology/ Industrial Fish and Fisheries-Biology of Fish	4	3	25	75	100	30	40
	III	Allied-Practical- I	Cell Biology, Genetics & Biotechnology/ Industrial Fish and Fisheries-Biology of Fish	2	1	50	50	100	20	40
	IV	Common	Environmental Studies	2	2	25	75	100	30	40
			Sub total	**30**	**23**					
II	I	Language	Tamil/Other Language	6	4	25	75	100	30	40
	II	Language	Communicative English-II	6	4	25	75	100	30	40
	III	Core	Chordata	4	4	25	75	100	30	40
	III	Add on Major (Mandatory)	Professional English for Life Sciences – II	4	4	25	75	100	30	40

	III	Core Practical-II	Chordata	2	1	50	50	100	20	40
	III	Allied	Developmental Zoology, Ecology, Animal Physiology & Evolution/Industrial Fish and Fisheries- Capture Fisheries	4	3	25	75	100	30	40
	III	Allied Practical II	Developmental Zoology, Ecology, Animal Physiology & Evolution/Industrial Fish and Fisheries- Capture Fisheries	2	1	50	50	100	20	40
	IV	Common	Value Based Education/Social Harmony	2	2	25	75	100	30	40
			Sub total	**30**	**23**					

All practical examinations are at the end of each semester

ELIGIBILITY FOR ADMISSION

Those who have passed Higher Secondary Examination conducted by the Board of Hr. Sec. Education - TN/ CBSE/ ICSE or Equivalent examination accepted by the syndicate of MSU with Biology/ Zoology as one of the subjects in Part III are eligible for admission to B.Sc., ZOOLOGY PROGRAMME.

DURATION OF THE PROGRAMME

The students shall undergo the prescribed programme of study for a period of not less than three academic years (Six semesters). Each semester contains 90 working days.

MARK ASSESSMENT

There is a separate passing minimum for the external and overall components. Distribution of marks between **Internal** and **External** Assessment is

For Theory: 25 : 75

For Practical: 50 : 50

Passing minimum of 40% is recommended for external and overall components.

Internal Marks for Theory (Core, Skill Based Core, Non- Major Elective, Core Elective, Common & Allied) shall be allotted in the following:

The average of the best two marks from three compulsory tests.

Each test is of one hour duration for **20** Marks

Assignment- **05** Marks

Total-**25** Marks

Internal Marks for Practical (continuous assessment) shall be allotted in the following manner.

Experimental Work-**25** Marks; Regularity-**25** Marks; Total- **50** Marks

QUESTION PATTERN: (EXTERNAL)

THEORY

Time: 3 hrs **Maximum: 75 marks**

Question paper will consist of

Part-A: Q. No: 1- 10

Objective type (2 questions from each unit) **(10x1=10 marks)**

Part-B: Q. No: 11- 15

Descriptive – short answer (Internal choice from each unit-2 questions for each)

(5x5=25 marks)

Part-C: Q. No : 16- 20 **(5x8=40 marks)**

Essay type Questions (Internal choice from each unit- 2)

6.MODEL QUESTION PAPER

MODEL QUESTION PAPER- CBCS-PATTERN (UG)

MAXIMUM MARKS: 75 TIME: 3 HOURS

Part -A (10×1 = 10 Marks)
Answer all the questions, Choose the correct answer

Question No.1,2	Unit –I	Question No.7,8	Unit -IV
Question No.3,4	Unit-II	Question No.9,10	Unit-V
Question No.5,6	Unit-III		

Part -B (5×5 = 25 Marks)
Answer All Questions, Choosing either (a) or (b). Each answer should not exceed 250 words

Question No.11(a) or 11(b)	Unit-I	Question No.14(a) or 14(b)	Unit-IV
Question No.12(a) or 12(b)	Unit-II	Question No.15(a) or 15(b)	Unit-V
Question No.13(a) or 13(b)	Unit-III		

Part-C (8×5 = 40 Marks)
Answer All Questions, Choosing either (a) or (b). Each answer should not exceed 600 words

(Question No.16(a) or 16(b)	Unit-I	Question No.19(a) or 19(b)	Unit-IV
Question No.17(a) or 17(b)	Unit-II	Question No.20(a) or 20(b)	Unit-V
Question No.18(a) or 18(b)	Unit-III		

PRACTICAL

Time: 3 hrs **Maximum: 50 marks**

Major Practical – **15** marks

Minor Practical – **10** marks

Identification (Spot tests) - **20** marks **(5x4=20)**

Observation Note - **05** marks

Total - **50** marks

.**Elective Course**: One among the three given courses will be selected.

To enrich the **skill development** of the students one among the following courses in their premises are conducted as Effective Communication/ Personality Development /Youth Leadership

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The B. Sc Programme will enable the student to

PEO1: acquire knowledge of current trends and practices in all aspects of science.

PEO2: equip and fulfil the demands of various competitive examinations and career developments.

PEO3: inculcate the temperament and thirst of research on recent developments at inter disciplinary level.

PEO4: get easy access in references with the available e-Learning programmes.

PEO5: raise the standard of the students of our state on par with international standards.

PEO6: promote the overall development of each student in educational, personal, social, cultural and intellectual perspectives and transform him/her to become a responsible citizen.

PROGRAMME OUTCOMES (POs)

Upon completion of B.Sc Programme the student will be able to

PO1: provide deep understanding of fundamental facts and concepts of Science and develop critical thinking skills in the field of Science.

PO2: effectively communicate scientific concepts orally and in writing and ensure scientific thinking.

PO3: express and exchange ideas related to scientific concepts for promoting social responsibility.

PO4: pursue higher studies up to research in multidisciplinary level and/or interdisciplinary become professionals.

PO5: practice ethics in personal and professional life to build a healthy nation.

PO6: construct a safe environment and plan sustainable utilization of resources

PO7: expertise in independent decision making and become economically independent.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Upon completion of B.Sc. Zoology Programme, the student will be able to

PSO1: analyse and communicate fundamental concepts in Zoology.

PSO2: apply practical skills in the specific fields of Zoology.

PSO3: practice bioethical principles in profession and life.

PSO4: identify, formulate and find solutions for complex environmental problems and epidemiological and health issues for the betterment of sustainable

development pertaining to a local community.

PSO5: explore their knowledge and acquired skills to access the qualitative and quantitative approaches using statistical packages for analysis and interpretation.

PSO6: clear competitive examinations in par with all levels.

PSO7: fulfil the needs of the society as Teachers, Professors, Researchers in Institutes and Biotech Companies, Biological Data Analysts, Wild life Biologists, Zoo-keepers, Curators of natural history museums, Lab technicians, Water quality analysts etc.

PSO8: support and be a part of nation building initiatives as an employee or an entrepreneur.

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -I /Core Course

CORE COURSE: 1. 1 - INVERTEBRATA

L	T	P	C
4	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- recall the diversity, taxonomy and relationship of animals.
- .classify the animals of invertebrate phyla and recognize their distinguishing features.
- elucidate the diversity of animals in a phylogenetic context and their evolution.
- . analyse and relate how the different body designs and adaptations solve biological problems of physiological and environmental challenges.
- .examine the role of invertebrates in biological communities, ecological interactions, and impact of conservation problems.

COURSE OUTCOMES (COs):

On successful completion of the course the student will be able to

CO1: relate the diversity and basic taxonomy of non- chordates.

CO2: interpret the biological status of the animals at basic level in their habitat.

CO3. analyse and examine the adaptations of the parasites and their impact on human health and welfare.

CO4. compare the diversity of arthropods and appraise their economic importance.

CO5: critically appraise the distribution and food value of molluscs and phylogenetic significance of echinoderms.

CO6: develop the conservation practices, sustainable economic utilisation and potentials in technological prospects and create awareness.

CO7: apply their acquired knowledge in invertebrates as foundation for studying further courses in higher level.

UNIT I

Classification of Animal Kingdom and Introduction

Concept of five kingdom classification of life. Introduction to Protista & Animal kingdom – Systems of classification & nomenclature levels of organization -Types of symmetry.

Protozoa: General characters & Classification up to classes with examples.

Type study: Paramecium

General topics: Protozoan parasites, Life cycle of Plasmodium, Locomotion & Nutrition in Protozoa.

(12L)

UNIT II

Porifera & Coelenterata: General characters & classification up to classes with examples Salient features of Ctenophora.

Type study: Leucosolenia & Obelia Colony

General topics: Canal system in sponges, Polymorphism in Coelenterates, Diversity /Types of corals and coral reefs.

(12L)

UNIT III

Platyhelminthes, Aschelminthes & Annelida: General characters & classification up to classes with examples.

Type study: Liver fluke, Ascaris & Neries

General topics: Nematode parasites & their adaptations, Metamerism in Annelids, Filter feeding in Polychaetes.

(12L)

UNIT IV

Arthropoda: General characters & classification up to classes with examples.

Brief descriptions of Limulus & Sacculina.

Type study: Prawn

General topics: Crustacean larvae, Mouth parts of insects, Social life in insects, Affinities of Peripatus.

(12L)

UNIT V

Mollusca and Echinodermata: General characters & classification up to classes with examples.

Type study: Pila & Starfish

General topics: Torsion & de-torsion in Gastropods, Cephalopods as an advanced Molluscs, Pearl and edible oyster culture, Echinoderm larvae and its phylogenetic significances.

(12L)

(TOTAL 60L)

COs at Cognitive level and mapping with POs and PSOs

SEMESTER I PART III : CORE COURSE 1.1 INVERTEBRATA																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-2 Understand**	3	3	3	3	2	1	1	3	3	3	3	3	**3**	**2**	**-**
CO2	**K-3 Apply**	3	3	3	3	1	1	1	3	3	3	2	**2**	**2**	**1**	**-**
CO3	**K-3 Analyse**	3	3	2	3	1	1	1	3	3	2	**2**	**1**	**1**	**1**	**-**
CO4	**K-4 Analyse**	3	3	2	3	2	1	1	3	3	2	2	2	2	-2	-
CO5	**K-4 Analyse**	3	2	2	3	3	1	1	3	2	2	3	3	3	2	1
CO6	**K-5 Evaluate**	3	2	2	2	3	3	2	3	2	2	2	2	2	3	2
CO7	**K-6 Creativity**	3	2	1	2	3	2	2	2	1	1	1	2	3	3	

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1)

No Correlation (0)

Books for reference

1. Barnes, R.D. Invertebrate Zoology (1982) Vi Edition. Holt Saunders International Edition.

2. Ekambaranatha Ayyar & T.N. Ananthakrishnan, Manual of Zoology Vol –I , Part I & IIS. Viswanathan. Chennai.

3. Kotpal RL, Agarwal SK & Khetarpal RP Invertebrates,Rastogi Publications, Meerut.

4. Jordan And Verma Invertebrate Zoology S. Chand & Co, New Delhi

5. Anderson TA, Invertebrate Zoology, Oxford University Press, New Delhi.

6. Barrington EJW, Invertebrate Structure and Functions. English Language Book Society.

7. Hyman LH, The Invertebrates (6 vols).McGraw-Hill Companies Inc. NY

8. Nair NC, Invertebrata & Chordata, Saras Publication Nagercoil.

9. Nair NC, Leelavathy S, SoundaraPandian , Murugan T & Arumugam N A Text Book of Invertebrates, Saras Publication Nagercoil.

10. Ebanasar J & Sheeja BD Outlines of five kingdoms of life, Shine and Twinkle

Publications, Nagercoil.

11. Mahanta Rita & I.K. Bhattacharyya. Invertebrate Zoology. 1. 11. Kalyani Publishers, B1/1299, Rajaendar Nagpur, Ludhiana-141008.

12. Parker & Haswell. A text Book of Zoology, Invertebrates Volume I. AITBS Publishers and Distributors, J5/6 Krishna Nagar, Delhi-110051

13. Verma, A. Invertebrates: Protozoa to Echinodermata. Naros Publishing House Private Limited.3536 Greams Road, Thousand Lights, Chennai –

E Resources:

1.https://www.notesonzoology.com/protozoa/economic-importance-of-protozoa-zoology/13241

2.https://www.onlinebiologynotes.com/coral-reefs-types-formation-and-economic-importance/

3.https://www.biologydiscussion.com/invertebrate-zoology/phylum-coelenterata/obelia-habitat-structure-and-diagram/28685

4.https://courses.lumenlearning.com/microbiology/chapter/parasitic-helminths/

5.https://www.biologydiscussion.com/ecology/colony-of-insects-ecology/59828

6.https://www.studyandscore.com/studymaterial-detail/pearl-culture-technical-requirements-process-and-methods

7.http://bncollegebgp.ac.in/wp-content/uploads/2020/04/BSc-Zoology-Part-I-Larval-forms-in-Echinoderms.pdf

MODEL QUESTION PAPER

(BASED ON BLOOM'S TAXONOMY)

Manonmaniam Sundaranar University-Tirunelveli-12

B. Sc., ZOOLOGY PROGRAMME

(For those who joined from 2021 – 2022 onwards)

SEMESTER I

CORE COURSE: 1. 1 – INVERTEBRATA

Time: 3 hrs **Maximum : 75 Marks**

PART A-(10 X 1 = 10 marks)

Answer all questions . Choose the correct answer	**Mapping level**
1. Radial symmetry is common in	(**CO1**) **K1**
a) Protozoa b) Annelida c) Arthropoda d) **Echinodermata**	
2. Protozoans are classified on the basis of	**(CO1) K2**
a) **locomotor organs** b) reproduction c) excretion d) nutrition	
3. Obelia is a	**(CO2) K2**
a) polymorphic colony b) **trimorphic colony** c) monomorphic colony	
d) dimorphic colony	
4. Nematocytes are	**(CO2) K2**
a) reproductive cells b) excretory cells c) **stinging cells** d) sensory cells	
5. Segmentation refers to	**(CO3) K2**
a) polymorphism b) tagmatization c) **metamerism** d) regeneration	
6. An example for tube dwelling polychaete	**(CO3) K1**
a) Neries **b) Chaetopterus** c) Megascolex d) Aelosoma	
7. Parasitic castration is seen in	**(CO4) K2**
a) Limulus b) Ascaris c) **Sacculina** d) Argulus	
8. Identify the male copulatory organs of Prawn	**(CO4) K3**
a) Telson b) **Petasma** c) Sternum d) Thelycum	
9. Mastigatory organs of Pila	**(CO5) K2**
a) Foot b) **Radulla** c) Ospharidum d) Ctenidium	
10. Seed of oyster industry	**(CO5) K2**
a) Mantle b) Shell c) Bivalves d) **Spat**	

PART B (5 X 5 =25 marks)

Answer all questions, choosing either (a) or (b) about 250 words

Draw diagrams wherever necessary

11. a) Classify the Animal kingdom in detail (OR) **(CO2) K2**

b) Enlist the characteristic features and classification of Protzoans with examples.

12. a) Explain the structures of body wall of Leucosolenia with neat diagram (OR) **(CO2) K3**

b) List out the types and economic importance of corals.

13. a) Write the classification of Annelida with suitable examples. (OR) **(CO3) K3**

b) Enumerate the salient features of parasitic adaptations in helminthine worms.

14. a) Compare the structural features of cephalic appendages of Prawn. (OR) **(CO4) K6**

b) Discuss the affinities of Peripatus.

15. a) Comment water vascular system in Star fish. (OR) **(CO5) K4**

b) Bring out the evolutionary significance of echinoderm larvae.

PART C-(5 X 8 =40 marks)

Answer all questions, choosing either (a) or (b) about 600 words

Draw diagrams wherever necessary

16. a) Explain the life cycle of Plasmodium and its impact on human beings. (OR**)** **(CO5) K4**

b) Examine in detail about the sexual reproduction of Paramecium.

17. a) Evaluate the essence of alternation of generation in Obelia. (OR) **(CO4) K4**

b) Describe the types of canal system in sponges and its biological role.

18. a) Explain the life history of Fasciola hepatica in detail. (OR) **(CO5) K5**

b) Define Metamerism. Elucidate its importance among invertebrates.

19. a) Evaluate the importance of different types of crustacean larvae. (OR) **(CO6) K5**

b) What are social insects? Prove their social life with their attributes..

20. a) "Cephalopods are Advanced Molluscs" – Justify (OR) **(C07) K6**

b) Substantiate the economic importance of molluscs with reference to oyster and pearl industry.

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -I / Core Practical

CORE COURSE PRACTICAL - I
INVERTEBRATA

L	T	P	C
--	--	2	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the student to

- find the internal structural organization of invertebrate animals.
- :identify the animals of invertebrate phyla and recognize their distinguishing characters with examples.
- classify the animals and analyse their biological importance

COURSE OUTCOMES (COs)

On successful completion of the practical course the student will be able to

CO1: analyse the distribution of non- chordates.

CO2: interpret the biological status of the animals.

CO3: appreciate the economic importance of the invertebrates

CO4: design a model for diversity and conservation of invertebrates

1. **Dissection and Mountings:** Cockroach- Nervous System, Digestive System, Trachea, Salivary Apparatus.
2. **Museum specimens, slides, models and charts:**
   Paramecium- entire, binary fission, conjugation, Plasmodium, Marine sponge, Obelia colony, Medusae of Obelia, Madrepora, Favia, Ascaris male and female, Fasciola, Earthworm, Nereis, Chaetopterus, Leech, Prawn, Limulus, Peripatus, Honey Bee, Nauplius larva, Zoea larva, Pila- shell, Sepia, Octopus, Pinctada, Edible oyster, Star fish, Bipinnaria larva, Auricularia larva and Sea cucumber.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER I PART III: CORE COURSE PRACTICAL I: INVERTEBRATA																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-3 Apply**	3	3	3	3	2	1	1	3	3	3	3	3	**3**	**2**	**-**
CO2	**K-4 Analyse**	3	3	3	3	1	1	1	3	3	3	2	**2**	**2**	**1**	**-**
CO3	**K-5 Evaluate**	3	3	2	3	1	1	1	3	3	2	**2**	**1**	**1**	**1**	**-**
CO4	**K-6 Creativity**	3	3	2	3	2	1	1	3	3	2	2	2	2	-	-

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1)
No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -II /Core

CORE COURSE: 2.1 - CHORDATA

L	T	P	C
4	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- understand the taxonomy, relationship and evolution of chordate animals.
- identify the classes of vertebrates and recognize their distinguishing features.
- appraise the diversity of animals in view of phylogenetic context.
- explain how the different body designs solve biological problems related to physiological and environmental challenges.
- develop an appreciation for the role of vertebrates in biological communities, ecological interactions, and conservation problems.

COURSE OUTCOMES (COs):

On successful completion of the course the student will be able to

CO1: recall the diversity and basic taxonomy of chordates.

CO2: understand and examine the biological systems and evolution of chordates.

CO3: analyse and compare the adaptations and their importance in distribution.

CO4: identify and appreciate the functions of vertebrate animals at various levels.

CO5: apply their skills for conservation, sustainable development, economic utilisation and its potentials in technological prospects.

CO6: appraise the behavioural patterns and distribution of mammals.

UNIT I

Chordata

Subphylum: Protochordata & Vertebrata: General characters and classification of Chordates up to classes with examples.

Type study: Amphioxus

Ascidian - External features- Retrogressive metamorphosis

Balanoglossus- Morphology and Affinities of Hemichordates.

Agnatha: Petromyzon- Salient features -Migration- Ammocoete larva

Type study: Scoliodon

General topics: Accessory respiratory organs in fishes, Types of fins and functions, Migration of Fishes.

(12L)

UNIT II

Amphibia: General characters and classification up to order with examples.

Type study: Frog

General topics: Metamorphosis of Amphibian, Limbless amphibians, Parental care in Amphibian, Paedogenesis.

(12L)

UNIT III

Reptilia: General characters and classification up to order with examples.

Type study: Calotes

General topics: Identification of Poisonous and non-poisonous snakes – Poison apparatus and types of poison - Biting mechanism & First aid. Salient features of Chelonia & Crocodilia. Skull of Reptiles.

(12L)

UNIT IV

Aves: General characters and classification up to order with examples.

Type study: Pigeon;- external characters – feathers- synsacrum- girdles and limb bones- Circulatory system- Respiratory system - Urinogenital system.

General topics: Flightless birds, Flight adaptations in birds, Feet and Beak modifications, Migration in birds.

(12L)

UNIT V

Mammals: General characters and classification up to order with examples.

Type Study: Rabbit:- External features- Integument and its derivatives- Digestive system- Respiratory system- Circulatory system – Nervous system- Urinogenital system – Endoskeletal system: atlas, axis, typical vertebrae and appendicular skeleton.

General topics: Diversity of Marsupials, Affinities of Prototheria, Aquatic mammals and their adaptation and Dentition in Mammals.

(12L)

(Total 60L)

COs at Cognitive level and mapping with POs and PSOs

SEMESTER II PART III: CORE COURSE -2.1 CHORDATA																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-2 Understand**	3	3	3	3	2	1	2	3	3	3	3	3	3	2	-
CO2	**K-3 Apply**	3	3	3	2	1	1	1	3	3	3	2	2	1	1	1
CO3	**K-3 Apply**	3	3	2	3	1	1	1	3	3	2	2	1	1	2	1
CO4	**K-4 Analyse**	3	3	2	3	2	1	2	3	3	2	2	2	2	2	1
CO5	**K-4 Analyse**	3	2	3	3	3	1	1	3	2	2	3	3	3	1	1
CO6	**K-5 Evaluate**	3	2	2	2	3	3	2	3	2	2	3	2	2	2	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1)

Books for references

1. Arumugam N Animal Diversity –Volume 2 .Chordata, Saras Publication, Nagercoil

2. Thangamani A, Prasannakumar S, Narayanan LM, Arumugam NA Text Book of Chordates, Saras Publication, Nagercoil.

3. Ekambaranatha Ayyar & T.N. Ananthakrishnan, Manual of Zoology Vol –II, S. Viswanathan. Chennai..

4. Kotpal RL Mordern Text Book of Zoology- Vertebrates, Rastogi Publications, Meerut.

5.Young, J.Z. 1950. Life of Vertebrates.Clarendon Press, Oxford, UK.

6. Pough Harvey F, Christine M .Janis and John B. Heiser .2002. Vertebrate Life, Pearson Education Inc. New Delhi.

7. Verma PS, Chordate Zoology, S Chand Publishers, New Delhi

8. Alexander, R.M. The Chordates Cambridge University Press.

9. Bhamrah, H.S. et al. A text book of chordates.Anmol publication Limited, 4374/4B Ansari Road, Daryaganj, New Delhi 110002.

10. Jordan E.L. and P.S Verma. Chordata Zoology (11th Edition). S. Chand and Company Limited, 7361 Ram Nagar, Qutab Road, New Delhi-110 055.

12. Kardong, K. Vertebrates: Comparative Anatomy, Function, Evolution. Tata Mc Graw Hill publishing Company Limited, 444/1.Sri Ekambara Naicker, Industrial estate, Alapakkam, Porur, Chennai-600 116.

13. Kulshrestha, S.K. Comparative Anatomy of Vertebrates, Anmol Publishers a Private limited, 4374/14B, Ansari Road, Daryaganj,.New Delhi-110 002.

14. Mahanta Rita and I,K.Bhattacharyya.VertebrateZoology,Kalyanipublishers,B-1/1299,Rajinder Nagar, Ludhiana-141008.

15. Nigam, H.C. Biology of Chrodates. Vishal Publishing Company, Books Market, Old Railway Road, Jalandhar-144008.

16. Prasad, S.N.and Kashyap Vasantika, P. Text Book of Vertebrate Zoology, New Age International publishers,4835/24

E Resources:

1. https://www.britannica.com/animal/amphioxus
2. http://rkclnmu.ac.in/wp-content/uploads/2020/04/ZOOLOGY-B-SC.-PART-1-PAPER-2-GROUP-A-RETROGRESSIVE-METAMORPHOSIS-IN-HERDMANIA-NAYAK-SHYAMA-PRASAD-GOPAL-13.04.20.pdf
3. https://www.notesonzoology.com/india/fishery/fishes-of-india-17-main-fresh-water-fishes-of-india/2871

4. https://www.notesonzoology.com/phylum-chordata/fishes/parental-care-in-fishes-with-diagram-vertebrates-chordata-zoology/8064
5. https://abel.mcmaster.ca/publications/pdfs/2011_Parental_Care_in_Fishes.pdf
6. https://old.amu.ac.in/emp/studym/100007348.pdf
7. https://www.tnwatchablewildlife.org/files/DiscoverBirds_4_beaks_and_feet.pdf
8. https://sciencemadefun.net/blog/birds-beaks-and-adaptations/https://www.lkouniv.ac.in/site/writereaddata/siteContent/20200405062753726 9amit_zool_Flightleass_Birds.pdf. Ansari Road, Daryaganj, New Delhi-1109002

MODEL QUESTION PAPER

(BASED ON BLOOM'S TAXONOMY)

Manonmaniam Sundaranar University-Tirunelveli-12

B. Sc. ZOOLOGY PROGRAMME

(For those who joined from 2021 – 2022 onwards)

SEMESTER II

CORE COURSE: 2.1 - CHORDATA

Time: 3 hrs Maximum marks: 75

PART A-(10 X 1 = 10 marks)

Answer all questions. Choose the correct answer **Mapping level**

1. Sea squirt is **(CO1) K1**

a)Amphioxus b) Balanoglossus c) Petromyzon d) **Ascidian**

2. The group in which notochord is present in anterior region only is **(CO1) K2**

a) **Cephalochordates** b) Hemichordates c) Urochordates d) Vertebrate

3. Cartilagenous fishes belongs to class **(CO2) K2**

a) Osteichthyes b) **Chondrichthyes** c) Plachodermi d) Dipnoi

4. The scales covered the body of shark are **(CO2) K2**

a) Ganoid b) Cosmoid c) **Placoid** d) Cycloid

5. The specialized teeth located on the upper jaws of poisonous snakes is **(CO3) K3**

a) tang b) hang c) **fang** d) hood

6. The fertilized eggs are wrapped round the back of the male frogs are **(CO4) K3**

a)Pipa sp **b) Alytes sp** c).Rhacophorus d) Dentrobatus

7. The bones are pneumatic in **(CO4) K4**

a) fish b) frog c) **pigeon** d) rabbit

8. In birds fourteen vertebrae are fused together to form a plate like structure called **(CO4) K3**

a) pectin b) **synsacrum** c) furcula d) keel

9. In mammals the body cavity divided into thoracic and abdominal portions by the presence of

a) corpus callosum b) **diaphragm** c) diastema d) sino auricular septum **(CO5) K2**

10. Marsupials are **(CO5) K3**

a) eutherians b) prototherians c) hypotherians d) **metatherians**

PART B (5 X 5 =25 marks)

Answer all questions, choosing either (a) or (b) about 250 words

Draw diagrams wherever necessary

11. a) Enlist the diagnostic characters of Vertebrates (OR**)** **(CO2) K3**

b) Give an account on the status of Balanoglossus.

12. a) Substantiate the migratory behaviour of fishes with suitable examples. (OR) **(CO3) K3**

b) Explain the digestive system of shark.

13. a) List down the general characters and classification of Amphibians. (OR**)** **(CO4) K4**

b) Analyse the components of poison apparatus and biting mechanism in snakes.

14. a) Summarize the strategy of migration in birds. (OR**)** **(CO5) K5**

b) Describe the components of respiratory system in Pigeon.

15. a) What is dentition? Explain its importance in the diversity of mammals. (OR) **(CO6) K5**

b) Discuss the uniqueness of egg laying Mammals.

PART C-(5 X 8 =40 marks)

Answer all questions, choosing either (a) or (b) about 600 words

Draw diagrams wherever necessary

16. a) State the salient features of Prochordates and classify up to classes with examples. (OR**)** **(CO3) K4**

b) Explain the external morphology, migration and reproduction of Peteromyzon.

17. a) Classify the types of accessory respiratory organs in fishes with specific examples. (OR) **(CO4) K5**

b) Explain the urinogenital system of shark with diagram.

18. a) Elucidate the parental care exhibited in Amphibians with illustrations. (OR) **(CO4)** **K5**

b) How will you identify poisonous snakes from non-poisonous snakes.

19. a) Enlist and explain the general characters and its classification up to subclasses of Aves. (OR) **(CO5)** **K6**

b) Critically evaluate and emphasise the importance of flight adaptations in Birds.

20. a) Describe the structure of brain of rabbit with neat labelled diagram. (OR) **(CO6)** **K5**

b) Consolidate and describe how the adaptations of aquatic mammals are suitable for life.

CORE COURSE PRACTICAL- II
CHORDATA

L	T	P	C
---	---	2	1

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- find the structural deferments between invertebrates and chordates animals,
- understand the structural organization of chordates animals.
- identify the importance of chordates adaptation for the need of the chordates habits and habitat.

COURSE OUTCOMES (COs):

On successful completion of the course the student will be able to

CO1: understand and recognize the internal structure of the chordate animals.

CO2: identify the different groups of chordates based on the anatomical characters.

CO3: distinguish and analyse the distribution of local chordate animals.

CO4: predict and classify the chordate animals based on the classification and morphological characters.

CO5: to ensure the importance of conservation of chordate animals.

1. **Dissections and Mountings:**

- **Shark** – Placoid Scales.
- **Shark** – Digestive system (Demonstration only) – model / chart / CD – students have to draw the diagram and write detailed account of the digestive system in the observation note book.
- **Frog** – Arterial system (Demonstration only) – model / chart / CD – students have to draw the diagram and write detailed account of the arterial system in the observation note book.
- **Frog** – Brain (demonstration only) – model / chart / CD – students have to draw the diagram of dorsal and ventral view and write detailed account of the brain in the observation note book.

- **Rabbit /Rat**– Urinogenital system (Demonstration only) – model / chart / CD – students have to draw the diagram and write detailed account of the urinogenital system in the observation note book
- **Rabbit/Rat** – Heart (demonstration only) – model / chart / CD – students have to draw the diagram of external and internal structure and write detailed account of the heart in the observation note book

2. **Museum Specimens, Slides, Models and Charts**

Amphioxus, Balanoglossus, Ascidian, Petromyzon, Narcine, Hippocampus, Anabas, Ichthyophis, Rhacophorus, Ambystoma, Axolotl larva, Chelone mydas, Chameleon, Draco, Cobra, Dryophis, Sea snake, Pigeon, Bat, Atlas, Axis, Typical vertebrae, Girdles and limb vertebrae of Rabbit and Synsacrum of bird.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER II PART III: CORE COURSE PRACTICAL II: CHORDATA																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
CO1	**K2- Understand**	3	3	3	3	2	1	1	3	3	3	3	3	3	2	1
CO2	**K3- Apply**	3	3	3	2	1	3	1	3	3	3	3	2	3	3	1
CO3	**K4- Analyse**	3	3	3	3	3	3	1	3	3	3	2	3	2	3	2
CO4	**K5- Evaluate**	3	2	3	2	3	2	1	3	3	3	2	3	2	3	1
CO5	**K6 – Creativity**	2	3	3	2	3	2	1	2	3	3	2	3	3	2	2

Strongly Correlated (3), Moderately Correlated (2), Weakly Correlated (1), No Correlation (0)

Suggested List of Supplementary Web Resources for Laboratory Exercises:

1.Anatomy of Frog: Pro Dissector (CD)- www.prodissector.com
2.Physiology of Frog: Physio Ex 4.0 (CD)- www.physioex.com
3.Anatomy of Chordates: The Vertebrate Dissection Guide Series (CD)–Learning Development CentrE University of Portsmouth
4.Anatomy of earthworm: The dissection works (CD); Source – www.scienclass.com; www.neosci.com
5.Anatomy of shark: Shark dissection and anatomy (video)- www.neosci.com
6.Cockroach dissection- www.ento.vt.edu
7. Mammalian Physiology– www.biopac.com

SYLLABUS FOR

ALLIED ZOOLOGY
(Allied Course for I/II Year B.Sc Science Programmes Other Than Zoology Programme Students)
&
INDUSTRIAL FISH AND FISHERIES- ALLIED
(Allied Course for I/II Year B.Sc Zoology Progrmme Students)

Under Choice Based Credit system - CBCS (For the candidates admitted to the course in the academic year 2021 – 2022 onwards)

MSU/2021-22/UG-Colleges/Part-III (Allied Zoology) SEMESTER -I /III /Allied Course

(Allied Course For I/II Year B.Sc Science Programmes other than Zoology Programme Students)

ALLIED COURSE: 1.1
CELL BIOLOGY, GENETICS AND BIOTECHNOLOGY

L	T	P	C
4	--	--	3

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- elucidate the structure and functions of the cell organelles
- exemplify the concept of genetics, the principles of inheritance and the role of genes in determining characters.
- understand the application of the innovative biotechnology.
- manipulate living organisms or parts of organisms to make products useful to human.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: recall the basic structure and function of the animal cell
CO2: understand the genetic principles about the inheritance of traits
CO3: apply the knowledge of biotechnological techniques
CO4: evaluate the applications on the welfare of human beings.

CELL BIOLOGY

UNIT I

Ultra structure and functions of (a) Plasma membrane (b) Mitochondria (c) Nucleus. Chromosomes – Structure, types and functions; Giant Chromosomes (Polytene and Lamp brush Chromosomes)**(12L)**

UNIT II

DNA: Structure (Watson and Crick Model)- Replication.

RNA: Different types – r RNA – mRNA – tRNA; Protein synthesis.

Cancer cells and Carcinogenesis – Definition, Types, Causes, Properties, Diagnosis and Treatment.**(12L)**

GENETICS

UNIT III

Simple Mendelian traits in man; Multiple alleles – ABO blood groups in man – problems. Rh-factor in human – Erythroblastosis foetalis. Multiple gene inheritance.**(12L)**

UNIT IV

Sex determination in man; Sex linked inheritance in man – Haemophilia, Colour blindness and Hypertrichosis.

Non disjunction and Syndromes in man – Klinefelter's syndrome, Turner's syndrome and Down's syndrome.

Inborn Errors of Metabolism in man – Phenyl ketonuria, Alkaptanuria and Albinism. **(12L)**

BIOTECHNOLOGY

UNIT V

Definition, scope and importance of Biotechnology, Basic concepts of genetic engineering.

Restriction and modification system – Cloning vectors – (pBR 322, Lambda phage) Introduction of cloned genes into host cells(Any three methods)– Transgenesis – Transgenic animals and its application.**(12L)**

(TOTAL: 60L)

Books for reference

CELL BIOLOGY

1. Ambrose, E.J & Dorothy, M.E: Cell Biology (ELBS CAMLOTPRESS)
2. De Robertis & De Robertis: Cell & Molecular Biology. (W.B. Saunders &co, Philadelphia).
3. De Robertis, E.D.P, Nowinski, W.N & Saez, F.A : Cell Biology (W.B. Saunders &co, Philadelphia).
4. Dupraw, EJ : Cell & Molecular Biology (Academic Press, NewYork)
5. Dyson, R.D :Essentials of Cell Biology (Allyn &BaconInc. Boston). Giese.A.C: Cell Physiology (W.B. Saunders &co,Philadelphia).

GENETICS

1. Strickberger : Genetics(MacMillan).
2. Farnsworth : Genetics (Harper andRow).
3. P.K.Gupta: Genetics (RastogiPublications)
4. P.S. Verma and Agarwal: Genetics (S.Chand & Co.Ltd.)
5. Altonburg,E: Genetics (Oxford & IBH publishing company)
6. Burns G.W.: The Science of Genetics (MacMillan)
7. A.C.Pai: Foundations of Genetics (Mc Gaw –Hill)

BIOTECHNOLOGY

a. Prof.V. Kumaresan,"Animal Biotechnology", Saras Publication, A.R.P. Camp Road, Periavilai, Kottar P.O.,Nagercoil, K.K.Dist., - 629002.
b. Kumar H.D." A text book of Biotechnology, Affiliated East – West Press(P) Ltd., NewDelhi.

3.Animal Biotechnology,2006,R.Sasidhara,MJPPublishers,Chennai.

4.Dubey R.C "A text book of Biotechnology"S.Chand& Co.,Ltd.,NewDelhi.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER I/III PART III ALLIED COURSE: I.1 CELL BIOLOGY, GENETICS AND BIOTECHNOLOGY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	2	2	1	1	2	1	3	2	2	2	1	2	2	2
CO2	**K-2 Understand**	2	3	2	2	2	3	1	3	3	2	2	1	3	3	2
CO3	**K-3 Apply**	2	3	2	2	1	3	2	3	3	3	2	2	3	3	3
CO4	**K-4 Analyse**	2	2	3	1	2	3	2	3	3	3	3	2	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

B.Sc. (CBCS) DEGREE EXAMINATION

I Semester

Model Question Paper (Based on Bloom's Taxonomy)

ZOOLOGY – ALLIED

Paper I- Cell Biology, Genetics & Biotechnology

(For those who joined from 2021 – 2022 onwards)

Time: 3hr Maximum: 75marks

PART-A(10 X 1 = 10 Marks)

Answer All questions by choosing the correct answer: **Mapping level**

1. The Controlling Center of the cell is ---------- **(COI)**
K2

(a) Chromosome (b) Nucleolus

(c) **Nucleus** (d) Golgi complex

2. ----------type of chromosome is 'L' shaped, during mitotic anaphase? **(CO2)**
K2

(a) Metacentric (b) **Sub metacentric**

(c) Acrocentric (d) Telocentric

3. Double Helix models of DNA was discovered by **(CO3)**
K1

(a) Robert Hooke (b) Robert Brown

(c) Pauling (d) **Watson and Crick**

4. The Okazaki fragments are joined into DNA by **(CO4)**
K2

(a) DNA Polymerase I (b) **Poly nucleotide ligase**

(c) DNAPolymerase II (d) Endonuclease

5. The common example for multiple alleles is---------- (**CO3**)
K2

(a) Down syndrome (b) **ABO Blood group**
(c) Skin colour in man (d) Phenylketonuria

6. Erythroblastosis foetalis is caused (**CO4**) **K2**

(a) Anemia (b) Diarrhea
(c) Jaundice (d) **Anemia and jaundice**

7. In alkaptonuria the enzyme defect is---------- **(CO4) K1**

(a) Lactase (b) Tyrosinase
(c) **Homogentisic acid oxidase** (d) Pyruvate kinase

8. Klinefelter's syndrome is by ---------- chromosomes **(CO3) K1**

(a) 44+XXY (b) 45+XX
(c) 44+X (d) **45+XXY**

9. PBR was named after **(CO4) K2**

(a) Bolivar (b) Adolf Engler
(c) Rodriguez (d) **Both (a) and (c)**

10. Joining of gene of interest with plasmid of donor is ---------- (**CO4**) **K2**

(a) Nucleation (b) Splicing
(c) Ligation (d) **Cloning**

PART-B (5 X 5 = 25)

Answer All questions choosing either (a) or (b)

Each answer should not exceed 250 words

11. (a) Analyse the structure of fluid mosaic model of Plasma membrane **CO2) K3**

(or)

(b) Elucidate the structure of Mitochondria

12. (a) Write down the Watson and Crick model of DNA **(CO3) K4**

(or)

(b) Explain the characteristic features of Cancer

13. (a) Write short notes on ABO blood group **(CO3) K3**

(or)

(b) Explain the Erythroblastosis foetalis.

14.(a) Write a brief account on Phenylketonuria **(CO3) K4**

(or)

(b) Explain Turner's syndrome

15. (a) Write the applications of PBR 322 **(CO4) K5**

(or)

(b) Give a short account on the uses of Genetic engineering

PART-C (5 X 8 = 40)

Answer all questions choosing either (a) or (b)

Each answer should not exceed 600 words

16. (a) Explain the structure and functions of Nucleus **(CO3)** **K4**

(or)

(b) Critically examine the structure and importance of Giant chromosomes

17. (a) Illustrates the characteristics and identifications of Cancer cells**.**

(or) **(CO4)** **K5**

(b) Describe in detail about the types of RNAs with reference to their functional importance

18. (a) Discuss and enlist the simple Mendelian traits in man **(CO4)** **K5**

(or)

(b) Explain the multiple gene inheritance with suitable example.

19. (a) Explain Klinefelter's syndrome and Down's syndrome in man **(CO4)** **K5**

(or)

(b) Write the genetic basis of inborn errors of metabolism in man with any two examples.

20. (a) Discuss the cloning vectors' role in genetic engineering **(CO4)** **K5**

(or)

(b) Explain how Transgenic animals are produced and list out its applications.

MSU/2021-22/UG-Colleges/Part-III (Allied Zoology) SEMESTER -I /III /Allied Practical

ALLIED ZOOLOGY PRACTICAL- I
CELL BIOLOGY, GENETICS & BIOTECHNOLOGY

L	T	P	C
--	--	2	1

- Mounting of Giant Chromosome in Chironomous larva (or) Squash preparation of mitotic stages in onion root tip cells.
- Observation of Simple Mendelian Triats among the students.
- Study of the following through Charts, Slides and Figures:
  Mitochondria, Interphase Nucleus, DNA, tRNA, ABO Blood group.

  Colour Blindness, Haemophilia, Klinefelter's syndrome, Down's syndrome.

  pBR 322, Lambda Phage, Recombinant DNA

MSU/2021-22/UG-Colleges/Part-III (Allied Zoology) SEMESTER -II /IV - Allied Course

ALLIED COURSE: 2.1

DEVELOPMENTAL ZOOLOGY, ECOLOGY, ANIMAL PHYSIOLOGY AND EVOLUTION

L	T	P	C
4	--	--	3

LEARNING OBJECTIVES (LOs)

The objectives the course are enabling the students to

- understand the sequential changes from cellular grade of organization to organ grade of organization in the development of multicellular organisms.
- study the interaction and the interdependence among environmental factors and living organisms.
- understand and analyse the functional significance of various organs and organ systems of animals.
- discern the evolutionary significance of the animals, origin of species, effects of mutation.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: recognize the basic concept of developmental stages of the animals
CO2: understand the interaction of abiotic and biotic factors in the ecosystem and its components
CO3: apply the knowledge of vital physiological functions of our body
CO4: evaluate the evolutionary concepts on origin of life.

UNIT I

DEVELOPMENTAL ZOOLOGY

Early development in Man: Structure of sperm and ovum; Fertilization – Cleavage, Morula, Blastocyst, Implantation and Gastrulation – Fate map. Placenta in mammals – types and functions. Test tube babies – Twins – Amniocentesis.
Nuclear Transplantation in Acetabularia.

(13L)

UNIT II

ECOLOGY

Abiotic factors: Biological effects of Temperature and Light; Biotic factors: Symbiosis, Commensalism, Mutualism, Parasitism, Prey- Predator Relationship; Adaptations: Desert adaptations; Community: Ecosystem – Structure and dynamics of a pond.
(13L)

UNIT III

ANIMAL PHYSIOLOGY

Nutrition: Food constituents – Carbohydrates, Proteins and Fats. Digestion: Role of enzymes in carbohydrate, protein and fat digestion. Absorption: Absorption of digested food.

Metabolism: Carbohydrate metabolism: Glycogenesis, Glycogenolysis, Glycolysis. Respiration: Transport and exchange of Oxygen and Carbon-di-oxide.Haemoglobin.

(13L)

UNIT IV

Excretion: Structure of Nephron – Urine formation – Dialysis; Nervous Co-ordination: Structure and types of neurons – Nerve impulse, conduction of nerve impulse through neuron and synapse; Reproduction: Structure of human testis and ovary, Graafian follicle, Menstrual cycle and its hormonal control.
(13L)

UNIT V
EVOLUTION

Theories of Evolution: Darwinism, Mutation theory of De Vries. Adaptive radiation in birds. Mimicry and Colouration.

(8L)

(TOTAL: 60L)

BOOKS FOR REFERENCE

Developmental Zoology

1.Arora, M.P. Embryology. Himalaya Publishing House,Ramdoot,

Dr. Bhalerao Marg, Girgaon, Mumbai- 400 004.

2.Arumugam, N. Developmental Biology, Saras Publication, 114/35G,A.R.P camp Road, Nagercoil.

Ecology

1. Agrawal. A.k. Ecology and environmental biology, student edition agrobios (india), behind nasrani cinema. Chopasani road. Jodhpur-342 002
2. Odum, E.P. Fundementals of Ecology International Student Edition W.B. Sounders Company, Philadelphia, London.

Animal Physiology

1. Agarwal, R.A., A.K. Srivastava and Kaushal Kumar. Animal Physiology and Biochemistry (3rd Edition). S. Chand & Company Limited, 7361 Ram Nagar, New Delhi-110 055.
2. Arora,M.P Animal Physiology (6th Edition). Himalaya Publishing House, Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai 400 004.

Evolution

1.Arora, M.P. Evolutionary Biology. Himalaya Publishing House, Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai 400 004.

2. Tomar, B.S. and S.P. Singh. Evolutionary Biology. Rastogi Publications, Gangotri, Shivaji Road, Meerut-250 002.

3. Organic Evolution Arumugam, N. Saras Publication, 114/35G,A.R.P camp Road, Nagercoil,

COs at Cognitive level and mapping with POs and PSOs

SEMESTER II/IV PART III ALLIED COURSE: 2.1 DEVELOPMENTAL ZOOLOGY, ECOLOGY, ANIMAL PHYSIOLOGY AND EVOLUTION																	
CO	**COGNITIVE LEVEL**	**PO**							**PSO**								
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
CO1	**K2- Understand**	3	3	3	3	2	1	1	3	3	3	3	3	3	2	1
CO2	**K3- Apply**	3	3	3	2	1	3	1	3	3	3	3	2	3	3	1
CO3	**K4- Analyse**	3	3	3	3	3	3	1	3	3	3	2	3	2	3	2
CO4	**K5- Evaluate**	3	2	3	2	3	2	1	3	3	3	2	3	2	3	1

Strongly Correlated (3), Moderately Correlated (2), Weakly Correlated (1), No Correlation (0)

B.Sc (CBCS) DEGREE EXAMINATION
Second Semester
Model Question Paper (Based on Bloom's Taxonomy)
ZOOLOGY – ALLIED COURSE
Developmental Zoology, Animal Physiology, Ecology & Evolution
(For those who joined in 2021-2022)

Time: 3hr Maximum: 75marks

PART -A (10 X 1 = 10) Mapping level

Choose the correct answer:

1. Enzyme dissolves the cementing substance of follicle cells present around the egg.
(a) Fertilizin (b) **Hyaluronidase** **(CO1) K1**
(c) Restriction enzyme (d) Antifertilizin

2.Cleavage in man is ---------- **(CO1) K2**
(a) holoblastic & rotational (b) unequal, holoblastic
(c) **holoblastic**, **unequal & rotational** (d) spiral

3. ---------- animals change their body temperature according to the environmental temperature are **(CO2) K2**
(a) Poikilotherms (b) **Homeotherms**
(c) Eurytherms (d) Stenotherms

4. The response of animals to the length of the day is called----------.
(a) Photokinesis (b) Phototaxis

(c) **Photoperiodism** (d) Phototropism **(CO3) K1**

5. ---------- is the indigestible part of carbohydrate .
(a) Glycogen (b) Sucrose
(c) **Roughage** (d) Cellulose **(CO3) K2**

6. Fructose is transported by the carrier protein ----------
(a) SGLT (b) **GLUT**
(C) Cotransport (d) Symport

7. ---------- is the functional unit of kidney. **(CO4) K1**
(a) Bowman's capsule (b) **Nephron**
(c) Glomerulus (d) Malpighian corpuscle

8. ---------- support and nourish the developing spermatozoa**.** **(CO4) K1**
(a) **Sertoli cells** (b) Germinal cells
(c) Epithelial cells (d) Lyedig's cells

9. Natural Selection theory of evolution was proposed by---------- **(CO4) K1**
(a) **Darwin** (b) Herbert Spencer
(c) Savage (d) Lamarck

10. Competition between members of different species is called ----------struggle.
(a) Intra - specific (b) **Inter - specific**
(c) Environmental (d) Inter-departmental **(CO4) K1**

PART-B (5 X 5 = 25)

Answer All Questions choosing either (a) or (b)
Each answer should not exceed 250 words.

11. (a) Explain cleavage process in **man** **(CO1) K2**

(or)

(b) Discuss the structure of ovum

12. (a) Give an account of adaptations in desert animals. **(CO2) K3**

(or)

(b) Write an essay on pond ecosystem

13. (a) Describe the process of carbon dioxide transport in man. **(CO3) K3**

(or)

(b) Explain how do enzymes involved in the digestion of fat

14. (a) Write notes on the structure of neuron **(CO4) K3**

(or)

(b) Describe the structure of ovary

15. (a) Give an account on struggle for existence. (**CO4) K3**

(or)

(b) Describe the origin of new species

PART-C(5 X 8 = 40)

Answer All questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) Explain the nuclear transplantation in Acetabularia **(CO1) K3**

(or)

(b) What is placenta ? Classify placenta based on the distribution of villi .

17. (a) Discuss how does light affect the life of organisms ? **(CO2) K4**

(or**)**

(b) What are the effects of temperature on the development and growth of animal.

18. (a) Explain the role of enzymes in carbohydrate digestion. **(CO3) K4**

(or)

(b) Write an essay on role of enzymes in lipid digestion.

19. (a) Explain the synapse**.** **(CO3) K3**

(or)

(b) Discuss the hormonal control of menstrual cycle

20. (a) Write an essay on adaptive radiation in birds (**CO4) K4**

(or)

(b) Explain Batesian and Mullerian mimicry with examples

MSU/2021-22/UG-Colleges/Part-III (Allied Zoology) SEMESTER –II/IV - Allied Course Practical

ALLIED ZOOLOGY PRACTICAL COURSE- II
DEVELOPMENTAL ZOOLOGY, ECOLOGY, ANIMAL PHYSIOLOGY & EVOLUTION

L	T	P	C
--	--	2	1

1. Mounting and observation of live sperms of a vertebrate.
2. Estimation of dissolved oxygen in two water samples and discuss the results
3. Qualitative test for glucose, protein and lipid.
4. Effect of temperature on the opercular movement of fish- Calculation of Q_{10}.
5. Museum specimens, slides, models and charts:

Developmental Zoology: Human sperm, Human ovum, Blastula, Gastrula, Diffuse Placenta, Zonary Placenta, Discoidal placenta, Cotyledonary Placenta (any two).

Ecology: Identification of any two planktons- either Fresh water (or) marine samples.

Echeneis and Shark, Hermit crab and Sea anemone, Sacculina, Secchi disc.

Animal Physiology: Intestinal villi, Nephron, Heart of mammal.
Evolution: Ancon sheep.

Allied Course Practical Examination at the end of each Semester

MSU/2021-22/UG-Colleges/Part-III (Industrial Fish and Fisheries –Allied) SEMESTER – I/III / Allied Course

(Allied Course for I/II Year B.Sc Zoology Progrmme Students from the Year 2021– 2022 Onwards)

ALLIED COURSE 1.1- BIOLOGY OF FISH

L	T	P	C
4	--	--	3

LEARNING OBJECTIVES (LOs)

The objectives the course are enabling the students to

- understand the basic concepts of biology of fishes
- analyse and compare structure and physiology of the fishes
- identify the feeding behaviour and food consumption of the cultured fishes
- apply the knowledge of the various aspects of growth and development of fishes.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: recognise the basic concept of biological features of fishes
CO2: understand and compare the structure and function of fishes
CO3: apply and synthesize the behaviour and feeding pattern
CO4: evaluate the strategy for rearing practices and marketing

CO5: design suitable breeding methods and scientific approach and understand the biology, food value, marketing of fishes and fishery products.

UNIT I

Introduction: Fish Biology – Definition and basic concepts of biosystematics. Importance of classification – Theories of biological classification. Variations in structure, Form, Skin, Coloration, Scales, Mouth, Jaws, Teeth, Fins, Spines and other structures used in taxonomic studies. Induced breeding techniques – Hatching methods – Seed and Brood transport.

(12L)

UNIT II

Study of external morphology and internal organization of a typical Elasmobranch and Teleost. Alimentary Canal and Associated Structures – Gills – Swim Bladder – Accessory Respiratory organs – Lateral line system – Sound and Light producing organs. Morphological and anatomical characters of Prawn, Crab, Lobster, Bivalve, Gastropod and Cephalopod (one example each)

(12L)

UNIT III

Natural food of fishes – Feeding habits in various groups of fresh water and marine fishes, Prawns, Crabs, Lobsters and Cephalopods. Qualitative and Quantitative estimation of food consumption based on experimental studies and stomach content analysis – Seasonal changes in food availability and food preference – Food and Feeding in relation to age – Food selectively – Feeding intensity. Nutrition of fishes and utilization of food, Feeding strategies and energies. Artificial feeding – Nutritional requirement.

(12L)

UNIT IV

Growth of fish – Absolute, Relative, Isometric and Allometric growth. The Cube Law – Methods for determination of growth – Length frequency analysis – Analysis of growth checks on hard parts like Scales, Otolith and Vertebrae – Estimation of growth by direct methods – Marking and tagging of fish for growth studies – Aging of fish and shell-fish based on length data and growth checks – Length weight relationships, Ponderal index, Relative condition factor and Gonado – Stomach index.

(12L)

UNIT V

Types of reproduction, Sex differences – Sexual maturity, Classification of maturity stages, Size at first maturity. Estimation of fecundity – Ova diameter frequency – Fecundity in relation to length, Weight, Age and food supply. Spawning habits – Factors affecting Spawning, Spawning seasons and frequency. Embryonic and early development – Types of egg and Larvae – Metamorphosis of larva – Larval life and feeding habits. Reproductive behaviour and parental care – Social behaviour – Aggregation and Shoaling. Migrations – Anadromous and Catadromous. **(12L)**

(TOTAL 60L)

BOOKS FOR REFERENCE

1. The Biology of Fishes, Kyle, H. M., T.F.H. Publication, Hong kong 366 P.
2. The Life of Fishes, Marshell, N.B.1965,Weidenfeld & Nicolson, London 402 P.
3. The Marine and Freshwater Fishes of Ceylon,Munro I.S.R,1982. .Soni Reprints Agency, New Delhi 351 P.
4. Inland Fishes of India and Adjacent Countries., Vol I & Vol II,Talwar, P.K. and A.G.Jhingran,1991,Oxford & IBH Publishing Co.Ltd.,New Delhi 1958 P.
5. Fisheries Ecology, Pitcher, T.J. & P.J.E. Hart,1992,Room Helm,London 414 P.
6. Introduction to the Practice of Fisheries Science .Royce, W.F.1984, Academic Press 438 P.
7. Fisheries Science its methods and application,1993,Rounsfell,G.A. and W.H.Everheart, John William & Sons New York,444

COs at Cognitive level and mapping with POs and PSOs

SEMESTER I/III PART III ALLIED COURSE 1: BIOLOGY OF FISH																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
CO1	**K2- Understand**	3	3	3	3	2	-	1	3	2	3	3	3	2	1	1
CO2	**K3- Apply**	3	3	3	2	1	3	1	3	3	3	3	2	3	3	1
CO3	**K4- Analyse**	3	3	3	3	3	3	1	3	3	3	2	3	2	3	2
CO4	**K5- Evaluate**	3	2	2	2	3	2	-	3	3	3	2	3	2	3	1
CO5	**K6 - Creativity**	2	3	3	2	3	2	-	2	3	3	3	2	3	-	1

Strongly Correlated (3), Moderately Correlated (2), Weakly Correlated (1), No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (Industrial Fish and Fisheries –Allied)
SEMESTER -I /III /Allied Course Practical

ALLIED COURSE PRACTICAL I- BIOLOGY OF FISH

L	T	P	C
--	--	2	1

PRACTICALS

1. Methods for Collection, Handling, Identification and Preservation of fish for taxonomic purposes.
2. Study of external morphology of fish. Specific identification of important fresh water and marine fishes, prawns, crabs, bivalves and cephalopods of India.
3. Identification of scales of fishes – Placoid, Cycloid and Ctenoid scales.
4. Study of food and feeding habits of fishes – Plankton feeder, Herbivore feeder, Carnivore feeder, Omnivore feeder, Detritus feeder. Study of Structural Adaptations for Diet.
5. Qualitative and Quantitative methods for Stomach content analysis.
6. Estimation of Oxygen, Carbon dioxide, Salinity content in water samples.
7. Plankton analysis in the water samples – any two.
8. Identification of Anadromous and Catadromous fishes.

Books for reference

1. The Biology of Fishes, Kyle, H. M., T.F.H. Publication, Hong kong 366 P.
2. The Life of Fishes, Marshell,N.B.1965,Weidenfeld& Nicolson, London 402 P.
3. The Marine and Freshwater Fishes of Ceylon,Munro I.S.R,1982.Soni Reprints Agency, New Delhi 351 P.
4. Inland Fishes of India and Adjacent Countries., Vol I & Vol II,Talwar, P.K. and A.G.Jhingran,1991,Oxford & IBH Publishing Co PvtLtd.,New Delhi 1958 P.
5. Fisheries Ecology, Pitcher, T.J. & P.J.E. Hart,1992,Room Helm,London 414 P.
6. Introduction to the Practice of Fisheries Science.Royce,W.F.1984,Academic Press 438 P
7. Fisheries Science its methods and application,1993,Rounsfell,G.A. and W.H.EverheartJohn William & Sons New York,444

B. Sc PROGRAMME EXAMINATION

Model Question (Based on Bloom's Taxonomy)

First Semester

Industrial Fish and Fisheries- Allied

1.1 BIOLOGY OF FISH

Time: 3Hrs Maximum: 75 Marks

PART : A (10×1=10 marks)

Answer ALL Questions Mapping level

Choose the correct Answer

1. Find out the name of taxonomy which deals with the properties of bones**.** **(CO1) K1**

(a) Soft taxonomy (b) Myotaxonomy (c) Chemotaxy (d) **Osteo taxonomy**

2. Terminal mouth is found in **(CO1) K1**

(a) **Sardinella** (b) Leiognathus (c) Stolephorus (c) Pellona

3. The lateral line system is composed of sense organ called **(CO2) K1**

(a) Euromasts (b) **Neuromasts** (c) Notomasts (d) Branchiomasts

4. Nautilus is a **(CO2) K2**

(a) **Cephalopod** (b) Gastropod (c) Isopod (c) Amphipod

5. Fishes which feed on macroscopic animals are called **(CO3) K2**

(a) Grazers (b) **Predators** (c) Strainers (c) Suckers

6. Find out the best example of binding agent which added to an artificial feed (**CO3) K1**

(a) Ethoxyquin (b) Vitamin E (c) **Starch** (c) Fish meal

7. The formula used to express the relationship between the length and weight of fish is

(a) A+W+C (b) D = W+C (c) A+CL2 (d) **W = CL3** **(CO3) K2**

8. Otoliths are used in calculating the

(a) **Age of fish** (b) Growth of fish (c) Both (a) and **(**b) (d) size of the fish **(CO4) K2**

9. Fishes having external fertilization is called **(CO4) K2**

(a) Viviparous (b) **Oviparous** (c) Ovoviviparous (d) All of these

10. Migration aimed for search of food is referred as (**CO4) K1**

(a) **Alimental migration** (b) Gametic migration

(c) Climatic migration (d) Osmoregulatory migration

PART B – (5×5= 25 marks)

Answer ALL questions choosing either (a) or (b) each not exceeding 250 words

11.a) What are the concepts of biosystematics?(or) (**CO1)**
K3

b).Compare the variations found in body forms of fishes with neat labels.

12.a) List out the salient features of a typical elasmobranchs.(or) (**CO2)**
K3

b). Summarize the functions of light producing organs in fishes

13.a) Discuss the feeding habits of fresh water fishes (or) **(CO3)**
K4

b).What are the methods used to analyze the gut content of fishes?

14.a) Elaborate the absolute growth.(or) **(CO4)**
K5

b). Differentiate between the Otolith and a scale.

15.a) Write down a detailed note on nest building habits of fishes(or**)** **(CO5)**
K4

b). Write an elaborate account on catadramous migration.

PART C – (5×8= 40 marks)

Answer ALL questions choosing either (a) or (b) each not exceeding 600 words.

16. (a) Explain about the types of scales of fishes (Or) **(CO1)**
K4

(b)Write an essay on Induced Breeding Techniques

17. (a) Explain in detail about the accessory respiratory organs and their functions in fishes.(Or)

(b)Summarize the morphological features of a Prawn with a neat label . **(CO2)**
K5

18. (a) Add a note on feeding habits of fresh water fishes(Or) **(CO3)**
K4

(b)What is artificial feed? Write the procedure of preparation of an artificial feed.

19. (a)Summarize the various types of growth in fishes(Or) **(CO4)**
K5

(b)What is tagging? Explain the types tags used to study the growth of fishes.

20. (a) Elucidate the parental care in fishes (Or) **(CO5)**
K4

(b)Write a brief account on any two migratory fishes and their migratory outline

SEMESTER –II/IV- Allied Course

ALLIED COURSE II - CAPTURE FISHERIES

L	T	P	C
4	--	--	3

LEARNING OBJECTIVES (LOs)

The objectives are to enable the students to

- understand the basic concepts, types and problems of capture fisheries
- analyse the different techniques of capturing methods
- identify and compare the cultivable fish species and benefits
- apply the knowledge of fish marketing.

COURSE OUTCOMES (COs):

On successful completion of the course the student will be able to

CO1: recollect the basic concepts of fisheries and recognize and solve the problems in capture fisheries

CO2: understand and adopt suitable/ recent technology for capturing

CO3: apply the knowledge on feeding pattern and design local strategy for management

CO4: evaluate and adopt suitable marketing method and overcome the problems

CO5: emphasize the application of laws and acts of Fisheries welfare

UNIT I

Capture Fisheries – Inland Capture Fisheries – Scope and importance of Capture Fisheries in India and World. Present yield and Estimates of Potential. Inland capture fishery resources of Indian Fisheries of major and minor carps. Cat fishes and other groups. Problems and management.

(12L)

UNIT II

Cold water fishery resources – Fisheries of trout, Mahaseer and other Cold water Species. Lacustrine fisheries – Species, Catch, Fishing gears, Potential and

Problems of Development and management. Estuarine fisheries. Fisheries of Brackish water lakes and back waters – Problems and Management.

(12L)

UNIT III

Salient features of cultivable species of fishes and shell fishes. Marine fishery resources of India – Fisheries of Sardine, Lesser Sardine, Anchovies, Other Clupeoids, Mackerel, Ribbon fishes, Tunnies, Carangids and Cephalopods.

(12L)

UNIT IV

Mid water and Demersal fisheries – Fisheries of Elasmobranches, Bombay duck, Cat fishes, Silver Bellies, Sciaenids, Pomfrets,Threadfins,Thread fin breams and Perches,Flatfishes,Prawnslobsters,Crabs,Mussels Oysters and Clams,Culture of edible Oyster.

(12L)

UNIT V

Biological aspects of fishery managements, Principles of Conservation, Development and Management Concept and practice. Population dynamics – Concept of recruitment and yield, problems of over fishing, MSY, MEY and OSY

(12L)

(TOTAL 60L)

Books for reference

1. Fish and Fisheries of India Jhingran V.G. 1982 Hindustan Publishing Corporation India Delhi Rev.Ed.
2. Prawns and Prawn fisheries of India Kurian C.V and V.C Sebastian 1982.Hindustan Publishing corporation (India) Delhi Rev.Ed.
3. Marine Fisheries.Bal D.V and K.V Rao 1990.Narendra Publishing House Delhi Rev.Ed.
4. Cold water fisheries of India. Jhingran V.G and K.L Sehgal 1979.Barrackpore Inland fisheries soceity of India.
5. Fisheries Development in India.Srivastava U.K and Dharma Reddy 1983.Concept publishing co.,New Delhi.
6. Introduction to the practice of fishery science, Royce 1984 Academic press,London.
7. Fishery Science its methods and Applications,Rounsefell,G.A and W.H Everhart 1953 John.Wiley, New York

COs at Cognitive level and mapping with POs and PSOs

SEMESTER II/IV PART III INDUSTRIAL FISH AND FISHERIES – ALLIED ALLIED COURSE 2.1 - CAPTURE FISHERIES																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
CO1	**K2- Understand**	3	3	3	2	1	-	-	3	3	3	3	3	3	-	-
CO2	**K3- Apply**	3	3	3	2	1	2	1	3	3	3	3	2	3	3	1
CO3	**K4- Analyse**	3	3	3	3	3	2	1	3	3	3	2	3	2	3	2
CO4	**K5- Evaluate**	3	2	3	2	2	2	1	3	3	2	2	3	2	3	1
CO5	**K6 – Creativity**	2	3	3	1	2	1	1	2	3	2	2	3	2	1	-

Strongly Correlated (3), Moderately Correlated (2), Weakly Correlated (1), No Correlation (0)

B. Sc DEGREE EXAMINATION
Model Question
Second Semester
Industrial Fish and Fisheries- Allied
CAPTURE FISHERIES

Time: 3Hrs Maximum: 75 Marks

PART : A (10×1=10 marks)
Answer ALL Questions
Choose the correct answer Mapping level

1. India has a coastline of
(a) 4082 km (b) 5691 km (c) 6412 km (d) **7516 km** **(CO1) K1**
2. Based on feeding behaviour, the fish Catla catla is a
(a) Bottom feeder (b) **Surface feeder** (c) Column feeder (d) Detritus feeder **(CO1) K2**
3. The characteristics feature of cold water fishes is **(CO2) K2**
(a) Narrow gill openings (b) Tolerance of freezing point of temperature
(c) Live in highly oxygenated water (d) **All of these**
4. Chilka lake is found in **(CO2) K1**
(a) Tamil Nadu (b) Kerala (c) **Odissa** (d) Goa
5. The Zoological name of oil sardine is **(CO3) K2**
(a) Rastrelliger kanagurta (b) Stolephorus tri
(c) **Sardinella longiceps** (d) Thryssa mystax
6. The Tuna fishes are comprised in the family **(CO3) K2**

(a) Clupeidae (b) Carangidae (c) **Scombridae** (d) Engraulidae

7. The elasmobranch fisheries represented by **(CO4) K1**

(a) Sharks (b) Rays (c) Skates (d) **All**

8. In pearl oyster, the nacre secretion is initiated by **the** **(CO4) K2**

(a) **Entry of foreign material between shell and mantle** (b) Maturity of the pearl oyster

(c) Spawning season (d) Metamorphosis

9. The area that is used for conserving and growing the fishes is called **(CO5) K2**

(a) Fish **sanctuaries** (b) Museum of fishes (c) Caves (d) Depository

10. The level of catch that provides the maximum net economic yield to society is **(CO5) K2**

(a) MSY (b) **MEY** (c) OSY (d) ESY

PART B – (5×5= 25 marks)

Answer ALL questions choosing either (a) or (b) each not exceeding 250 words

11.a) Why the west coast is more productive than east coast?.(or**)** **(CO1) K3**

b).Add a short note on cat fishes.

12.a) List out the characteristic features of cold waters.(or) **(CO2) K3**

b).What is estuary? Briefly explains about types of estuaries.

13.a) Discuss the salient features of cultivable species of fin fishes.(or) **(CO3) K4**

b).Explain the different types of crafts and gears used to capture of tunnies.

14.a) Explain the importance of shark fishery resources in India.(or) (**CO4) K4**

b). Add a brief account on commercially important marine prawns.

15.a) What are the steps taken to maintain fish population for the present and future?(or)

b).Explain – OSY **(CO5) K5**

PART C– (5×8= 40 marks)

Answer ALL questions choosing either (a) or (b) each not exceeding 600 words.

16.(a) Describe the importance of capture fisheries of the world. Or **(CO1) K3**

(b).Write an essay on problems and fishery management of inland waters.

17. (a) What is lacu-strine fishery? Explain the hydro-biological factors of it. Or **(CO2) K4**

(b) How will you classify the estuarine fishes according to their feeding habits and migratory behaviours?

18.(a)Explain the importance of sardine fishery resources Or (b)Write an essay on Cephalopods. **(CO3) K4**

19.(a) Discuss the morphological features of cat fishes with a neat label Or **(CO4) K4**

(b) What are methods used to cultivation .of oysters?

20.(a) Add a brief account on steps that are taken to fishery management and conservation.

Or **(CO5) K5**

(b) Explain the problems of overfishing Capture fisheries.

MSU/2021-22/UG-Colleges/Part-III (Industrial Fish and Fisheries –Allied)/ SEMESTER -II /IV/ Allied Course Practical

ALLIED COURSE PRACTICAL II- CAPTURE FISHERIES

L	T	P	C
--	--	2	1

1. Identification of commercial fresh water and marine prawns.
2. Visit to a Prawn farm.
3. Visit to a fish processing industry.
4. Visit to a Landing center.
5. Raceway culture system.
6. Field visit to observe fishing and to collect field data regarding species composition, Craft, Gear and Field problems regarding riverine, estuarine, reservoir and cold water fisheries.
7. Study of fishery development programmes.
8. Study of fishery management problem – Laws, Acts and field problems.

Allied Course Practical Examination at the end of each Semester

MANONMANIUM SUNDARANAR UNIVERSITY, TIRUNELVELI-12

B. Sc ZOOLOGY PROGRAMME
CHOICE BASED CREDIT SYSTEM – CBCS
Syllabus for Affiliated Colleges
with effect from the academic year 2021- 2022 onwards
(incorporated with Learning Outcome based Curriculum Framework- LOCF)

Sem	Part I/ II/III IV/V	Course Status	Course title	Contact Hrs/ Week	Credits	Marks				
						Maximum			Passing minimum	
						Int	Ext	Total	Ext	Total
III	I	Language	Tamil/Other Language	6	4	25	75	100	30	40
	II	Language	English	6	4	25	75	100	30	40
	III	Core	Cell Biology and Biochemistry	4	4	25	75	100	30	40
	III	Core Practical-III	Cell Biology and Biochemistry	2	1	25	75	100	30	40
	III	Allied	Cell Biology, Genetics and Biotechnology/ Industrial Fish and Fisheries-Biology of Fish	4	3	25	75	100	30	40
	III	Allied Practical -I	Cell Biology, Genetics and Biotechnology/ Industrial Fish and Fisheries-Biology of Fish	2	1	50	50	100	20	40
	III	Skill Based-Core	(Any one) 1. Home Aquarium 2. Nutrition and Dietetics	4	4	25	75	100	30	40

	IV	Non-Major Elective	(Any one) 1. Bee Keeping 2. Clinical Biology	2	2	25	75	100	30	40
	IV	Common	YOGA*	2	2	25	75	100	30	40
			Sub total	**30**	**25**					
IV	I	Language	Tamil/Other Language	6	4	25	75	100	30	40
	II	Language	English	6	4	25	75	100	30	40
	III	Core	Genetics	4	4	25	75	100	30	40
	III	Core Practical-IV	Genetics	2	1	50	50	100	20	40
	III	Allied	Developmental Zoology, Ecology, Animal Physiology and Evolution/ Industrial Fish and Fisheries- Capture Fisheries	4	3	25	75	100	30	40
	III	Allied Practical-II	Developmental Zoology, Ecology, Animal Physiology and Evolution / Industrial Fish and Fisheries- Capture Fisheries	2	1	50	50	100	20	40
	III	Skill Based -Core	(Any one) 1.Biophysics and Bioinstrumentation 2.Vermitechnology	4	4	25	75	100	30	40
	IV	Non-Major Elective	(Any one) 1.Public Health and Hygiene 2.Community and Social Preventive Medicine.	2	2	25	75	100	30	40
	V	Extension Activity	NCC/NSS/YRC/YW/ PE		1	25	75	100	30	40
	IV	Common	Computer for Digital Era*		2	25	75	100	30	40

			Sub total	**30**	**26**					
V	III	Core	Developmental Zoology	5	4	25	75	100	30	40
	III	Core	Microbiology and Immunology	5	4	25	75	100	30	40
	III	Core	Animal Physiology	6	4	25	75	100	30	40
	III	Core	Ecology	5	4	25	75	100	30	40
	III	Core Practical-V	Developmental Zoology & Microbiology and Immunology	3	2	50	50	100	20	40
	III	Core Practical-VI	Animal Physiology	2	1	50	50	100	20	40
	III	Core Practical-VII	Ecology	2	1	50	50	100	20	40
	IV	Skill Based Common	Personality Development/ Effective Communication/ Youth Leadership	2	2	25	75	100	30	40
			Sub total	**30**	**22**					
VI	III	Core	Evolution	5	4	25	75	100	30	40
	III	Core	Animal Biotechnology	5	4	25	75	100	30	40
	III	Core	Biostatistics, Computer Applications and Bioinformatics	5	4	25	75	100	30	40
	III	Core Elective- I	Group A (Any one) 1. Sericulture 2. Aquaculture 3. Dairy Production Technology	5	4	25	75	100	30	40
	III	Core Elective-II	Group B (Any one) 1. Apiculture 2. Food and Food Processing Technology	4	4	25	75	100	30	40

			3. Poultry Science							
	III	Core Practical-VIII	Evolution & Animal Biotechnology	2	2	50	50	100	20	40
	III	Core Practical-IX	Biostatistics, Computer Applications and Bioinformatics	2	1	50	50	100	20	40
	III	Core Elective Practical-X	Corresponding Core Electives- I & II	2	1	50	50	100	20	40
			Sub total	**30**	**24**					

All practical examinations are at the end of each semester

*Extra credit for extra hours

Total number of hours: **180**

Total number of Credits: **143**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The B. Sc Programme will enable the students to

PEO1: acquire knowledge of current trends and practices in all aspects of Science

PEO2: equip and fulfil the demands of various competitive examinations and career developments..

PEO3: inculcate the temperament of research on recent developments at interdisciplinary level

PEO4: get easy access to references with available e-Learning programmes.

PEO5: raise the standard of the students of our state on par with international standards.

PEO6: promote the overall development of each student in the educational,

personal, social, cultural and intellectual perspectives and help them to become responsible citizens.

PROGRAMME OUTCOMES (POs)

Upon completion of B.Sc. Programme the student will be able to

PO1: provide deep understanding of fundamental facts and concepts of Science and develop critical thinking skills in the field of Science.

PO2: effectively communicate biological concepts orally and in writing and ensure scientific thinking.

PO3: express and exchange ideas related to biological concepts for promoting social responsibility.

PO4: pursue higher studies up to research in multidisciplinary level and become professionals.

PO5: practice ethics in personal and professional life to build a healthy nation.

PO6: construct a safe environment and plan sustainable utilization of resources

PO7: expertise in independent decision making and become economically independent.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Upon completion of B.Sc. Zoology Programme, the student will be able to

PSO1: understand, analyse and communicate fundamental concepts in Zoology.

PSO2: apply practical skills in the specific fields of Zoology at all levels.

PSO3: practice bioethical principles in profession and life.

PSO4: identify, formulate and find solutions for complex environmental problems and epidemiological and health issues for the betterment of sustainable development pertaining to a local community.

PSO5: explore their knowledge and acquired skills to access the qualitative and quantitative approaches using statistical packages for analysis and interpretation.

PSO6: clear competitive examina tions in par with all levels.

PSO7: fulfil the needs of the society as Teachers, Professors, Researchers in Institutes

and Biotech Companies, Biological Data Analysts, Wild life Biologists,

Zoo-keepers, Curators of natural history museums, Lab technicians,

Water quality analysts etc.,

PSO8: support and be a part of nation building initiatives as an employee or an entrepreneur.

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -III /Core

CORE COURSE: 3.1
CELL BIOLOGY AND BIOCHEMISTRY

L	T	P	C
4	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- recall the types and structure of cell.
- elucidate the ultra structure and functions cell organelles.
- analyse and relate how the different cell organelles are functioning.
- explain the classification and role of biomolecules.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: understand cell, its biology, and origin of cells, diversity and structure and learn the basic differences between prokaryotic and eukaryotic cells and understand the basis of cytological techniques, principle of working and its application of microscope.

CO2: analyse the structural organization and function of plasma membrane, mitochondria, nucleus, lysosomes etc.

CO3: acquire knowledge about how cell divides by means of meiosis and mitosis and factors which control cell cycle, structure of DNA and replication of DNA in cells.

CO4: describe the process of transcription, RNA processing and translation in prokaryotes and eukaryotes.

CO5: understand the causes and effects of cancer.

CO6: explain the structure and biological significance of carbohydrates, aminoacids, proteins and lipids.

CO7: apply the acquired knowledge in cell and molecular biology as foundation for getting new avenues by joining further courses in higher studies.

UNIT I
INTRODUCTION TO CELL, CYTOLOGICAL TECHNIQUES &MICROSCOPY

Cell Biology- Scope in Modern perspective. Cell theory: Modern version and interpretation.
Prokaryotic and Eukaryotic cells: Structure.
Cytological techniques: Fixation–Sectioning & Staining.
Microscopy: Principle, resolving power & uses of Compound microscope, Phase contrast microscope and Electron microscope.
(12L)

UNIT II
CELL ORGANELLES- ULTRA STRUCTURE & FUNCTION

Plasma membrane- cell junction; Endoplasmic reticulum; Golgi apparatus; Lysosomes; Centrosomes; Ribosomes; Mitochondria - Glycolysis and Krebs cycle- Electron Transport Chain and Formation of ATP, Nucleus and Nucleolus.
(12L)

UNIT III

CHROMOSOMES &CELL CYCLE

Chromosomes: Structure, types and function-Chromatin–Nucleosome; Giant chromosomes.
DNA: structure, replication and types.

Cell cycle: cell division- mitosis and meiosis and interphase and its regulation. Mutations in the genes that regulate cell cycle and division - their role. Carcinogenesis: cancer types – carcinogen. Programmed cell death (Apoptosis).

(12L)

UNIT IV

TRANSCRIPTION &TRANSLATION
Transcription : types of RNA - m RNA synthesis, role of RNA- Structure of t-RNA. Properties of Genetic code.
Translation: Detailed study of Protein synthesis – Polysomes – differences in eukaryotes– short outline of post transcriptional modifications.
(12L)

UNIT V

BIOCHEMISTRY

Structure and Classification of Carbohydrates, Protein, Amino acids, Lipids.

Enzymes: classification - mechanism of action - factors influencing enzyme action – Enzyme Inhibition.

Metabolism: Glycogenesis– Glycogenolysis- Gluconeogenesis and HMP shunt; Deamination & Transamination; β - oxidation of fats.

(12L)

(Total: 60L)

Books for reference

1. Gupta PK, Cell Biology, Rastogi Publications, Meerut.
2. Jain JL, Jain N & Jain S. Fundamentals of Biochemistry, S. Chand Publications, New Delhi.
3. Pawar CB, Cell Biology, Himalaya Publications.
4. Ramadevi K, Ambika Shanmugam., Fundamentals of Biochemistry for Medical Students, Williams &Wilkins
5. Verma PS & Agarwal VK Cell Biology S.Chand Publishers, NewDelhi
6. Becker, W.M; Kleinsmith, L.J: Hardin. J. and Bertoni, G.P. (2009) The World of the Cell. (7th edition) Pearson Benjamin Cummings Publishing, Sanfransisco.
7. Walter, P. (2007) Molecular Biology of the Cell (5th edition) Garland Science.
8. Zubay, G. (2017) Biochemistry (4th edition) Mc Graw- Hill

E-Resources:https://pdfcoffee.com.principles of biochemistry-zubay.

https://www.pdfdrive.com>biochemistry.

https://pubs.acs.org>doc>pdf

https://wepdf.com>biochemistrysc rastogi

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: III PART III: CORE COURSE : 3.1 CELL BIOLOGY AND BIOCHEMISTRY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	1	3	1	2	1	3	3	3	2	2	3	3	2
CO2	**K-2 Understand**	3	3	2	3	1	1	1	3	1	2	2	2	3	2	2
CO3	**K-3 Apply**	3	3	1	3	1	2	1	3	3	3	2	2	3	3	2
CO4	**K-4 Analyse**	3	3	2	3	1	1	1	3	1	2	2	2	3	2	2
CO5	**K-5 Evaluate**	3	3	2	3	3	1	1	3	1	2	2	2	3	2	2

CO6	**K-5 Evaluate**	3	2	2	2	3	3	3	3	3	3	2	3	3	3	2
CO7	**K-6 Create**	2	2	2	2	3	3	3	3	2	2	3	2	2	3	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0).

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -III /Core Practical

CORE PRACTICAL III: CELL BIOLOGY AND BIOCHEMISTRY

L	T	P	C
--	--	2	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the student to

- find out the mitotic stages and observe the chromosomal segregation in onion root tip cells.
- identify the structural organization of polytene chromosomes in chironomous larva.
- know how to prepare a smear / squash preparation of squamous epithelial cells, meiotic stages of grass hopper testis cells and human blood smear.
- determine the influence of temperature and enzyme concentration on salivary amylase activity.

COURSE OUTCOMES (COs)

On successful completion of the practical course the student will be able to

CO1: understand the segregation of chromosomes in different mitotic stages.

CO2: analyse the organization of polytene chromosomes under high power of the light microscope.

CO3: develop the skill to prepare and identify the squamous epithelial cells, meiotic stages in grass hopper testis cells and distinguish the different types of blood cells.

CO4: test and analyse the qualitative tests for protein, carbohydrate and fat.

CO5: evaluate and verify the influence of temperature and enzyme concentration on salivary amylase activity.

PRACTICALS

1. Observation of Chromosome segregation in mitosis - Onion root tip cells.
2. Observation of Polytene chromosomes in Chironomous larva
3. Meiosis in Grass hopper testis cells– (demonstration)
4. Preparation of smear of squamous epithelium and human blood.
5. Qualitative test for Carbohydrate (Glucose), Protein and Lipid- Any two tests for each.
6. Action of Salivary amylase in relation to enzyme concentration
7. Action of Salivary amylase in relation to temperature
8. **Slides**, **Models and Charts**- DNA, t-RNA, m- RNA, Ribosome, Interphase Nucleus, Mitochondria, Endoplasmic reticulum, Golgi complex, Protein synthesis, Glucose, Fructose, Sucrose, Amino acid.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: III PART III: CORE COURSE PRACTICAL III : CELL BIOLOGY AND BIOCHEMISTRY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-2 Understand**	1	2	-	-	2	1	1	2	3	3	3	3	3	3	2
CO2	**K-3 Apply**	3	2	2	-	2	1	1	3	3	1	3	2	2	2	1
CO3	**K-4 Analyse**	3	3	2	2	2	1	1	3	2	1	-	1	2	3	1
CO4	**K-5 Evaluate**	3	3	-	3	2	1	1	3	3	1	=	1	2	3	1
CO5	**K-6 Create**	2	3	1	2	3	1	-	3	2	1	-	2	2	3	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MODEL QUESTION PAPER

(BASED ON BLOOM'S TAXONOMY)

Manonmaniam Sundaranar University-Tirunelveli-12

B. Sc. ZOOLOGY PROGRAMME

(For those who joined from 2021 – 2022 onwards)

SEMESTER III

CORE COURSE: 3.1 – CELL BIOLOGY AND BIOCHEMISTRY

Time: 3 hrs **Maximum:75 marks**

Part A **(10 x 1 = 10)**

Answer ALL questions. Choose the correct answer **Mapping Level**

1. The cells with true nucleus are called as ------ cells **(CO1) K1**

a) **eukaryotic** b) prokaryotic c) nucleoids d) Mesosomes

2. The process of colouring cells **(CO1) K2**

a) embedding b) sectioning c) **staining** d) fixation

3. --------- is the transport of materials through a cell membrane. **(CO2) K2**

a) Cyclosis b) Phagocytosis c) Endocytosis d) **Osmosis**

4. Identify the power house of a cell **(CO2) K2**

a) **Mitochondria** b) Nucleus c) Lysosomes d) Golgi complex

5. Apotosis is **(CO3) K2**

a) RNA synthesis b) metabolism c) respiration d) **programmed cell death**

6. Cancerous growth in epithelial cells is **(CO4) K4**

a) Sarcoma b) **Carcinoma** c) Lymphoma d) Myeloma

7.Proteins are translated from **(CO4) K2**

a) DNA b) r-RNA c) ribosomes d) **m-RNA**

8. Functional unit, cistron is present in **(CO4) K3**

a) DNA b) t-RNA c) **m-RNA** d) r- RNA

9. In β- oxidation,---------- is converted into

Acetyl-CoA **(CO5) K2**

a) **fatty acids** b) amino acids c) pyruvic acids d) stearic acids

10. The term enzyme was introduced by **(CO6) K1**

a) Knoop b) **Kuhne** c) Kelvin d) Keller

PART B- (5x5=25 marks)

Answer all questions, choosing either (a) or (b)

11. a Analyse the aim of fixation? Or **(CO1) K3**

b. Differentiate prokaryotic cells from eukaryotic cells.

12. a. Describe the structure of Golgi complex. Or **(CO2) K2**

b.Write short notes on the importance of nucleolus.

13.a. Describe the structure and functions of polytene chromosomes. Or **(CO3) K3**

b. Explain the cytology of cancer cells.

14.a. Ellucidate the structure of t-RNA. Or **(CO4) K4**

b. Explain the importance of polysomes.

15. a. How will you classify the enzymes? Or **(CO5) K5**

b. List out the role of deamination and transamination in protein metabolism?

PART-C (8 x 5 = 40)

Answer ALL questions choosing either a or b

16. a. Appraise the structure and working mechanism of Electron Microscope. Or **(CO7) K6**

b. Illustrate the methodology to prepare a permanent slide for C.S of any organ of your interest.

17.a. Relate the different functions of plasma membrane with its structural organizations? Or **(CO2) K5**

b. Describe Polymorphism in Lysosomes and its importance in cell function.

18. a. Explain the mechanism of replication of DNA in detail. Or **(CO5) K4**

b. Describe the structure and functional role of mitotic apparatus in cell division.

19. a. Construct a model of protein synthesis in prokaryotes in detail Or **(CO6) K5**

b.What is genetic code? Explain its salient features

20. a. Criticise the factors influencing enzymes action and inhibition? Or **(CO5) K4**

b. Examine the role of Glycogenesis in carbohydrate metabolism.

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -III / SKB -Core

(SKILL BASED CORE COURSE)- Any one

SKB- CORE: 3.2A- HOME AQUARIUM

L	T	P	C
4	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- understand the construction of home aquarium.
- know the setting and maintenance of aquarium.
- acquire knowledge on selection, culture and breeding techniques.
- gain knowledge on reproduction of fishes, diseases control and prevention.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: find the prerequisites for the construction of standard home aquarium.

CO2: demonstrate setting up an aquarium and culture practices.

CO3: choose suitable species to culture and develop protocol for maintenance.

CO4: perceive knowledge on reproductive aspects and disease management.

CO5: propose plan to keep aquarium as a small scale industry

UNIT I

BASICS OF CONSTRUCTION

Construction of Home Aquarium: Materials needed – Wooden and metal frames – Frameless tanks – Sealants and Gums. Design and Construction of Public Freshwater and Marine Aquaria. Aerators and Filters – Hand net and other equipment. Water quality requirements – Temperature control and Lighting.

(13L)

UNIT II

AQUARIUM SETTING

Setting up an aquarium: gravel/ pebbles – Plants – Ornamental objects and fishes – Selection. of species – Introducing fishes to the aquarium. Nutritional requirements of aquarium fishes. Different kinds of feeds, Culture of food organisms. Preparation of dry feeds. Feeding methods

(11L)

UNIT III

CULTURABLE SPECIES

Species of ornamental fishes: Taxonomy and biology of Gold fish, Guppies, Sword tails, Marine fishes – Angels and Butterfly fishes. Fresh water species – live bearers and egg layers, one example each – Common Community fishes – Freshwater and marine, any two examples each.

(12L)

UNIT IV

REPRODUCTION

Reproductive biology of gold fish and angel fish: Maturation, Secondary sexual characters, Breeding habits, Spawning, Parental care, Fertilization and Development of eggs. Common diseases of freshwater and marine aquarium fishes: Parasitic, Fungal, Bacterial- Symptoms – Treatment – Prevention and control.

(13L)

UNIT V

FRESH WATER PLANTS & ORNAMENTAL ANIMALS

Taxonomy and morphology, any three of aquarium plants – provision of nutrient and optimum environmental condition for their growth. Other Ornamental organisms – Anemones, Lobsters, Shrimps, Octopus, Star fish etc.,

(11L)

(TOTAL: 60L)

Books for reference

1. Guide to tropical fish keeping, 1967, Braymer, J.H.P.ILiffe.
2. Tropical Marine aquaria, 1974. Cox, J.F.Hamlyn.
3. Tropical Fish: Setting up and maintaining fresh water and Marine aquaria,1972. Dussa Octopus Book Ltd.
4. Aquarium systems, 1981. Hawkins, A.S. (Ed.) Academicpress.

5. Living Aquarium, 1981. Hunnam, P. Ward Lock.
6. Aquarium Fishes and Plants, 1971, Rataj, K. and R. Zukal –Hamlyn.
7. Ornamental Fish for Garden and Home Aquariums, 1956, R and C.P. Home Aquariums.
8. Sea Water Aquariums, 1979. Spotte, S. JohnWiley.
9. Collins Guide to Aquarium Fishes and Plants, 1969.Schiotz, A.Collins. Complete Aquarium, 1963.Vogt, D. and H. Wermuth Thames.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: III PART III: SKILL BASED CORE COURSE : 3.2A- HOME AQUARIUM															
CO	**COGNITIVE LEVEL**	**PO**							**PSO**						
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	1	3	-	-	-	2	-	1	1	-	3	2	-	2	3
CO2	**K-2 Understand**	3	3	2	2	-	2	2	3	3	2	3	2	2	3	3
CO3	**K-3 Apply**	3	3	2	3	-	3	2	3	3	2	3	2	2	3	3
CO4	**K-4 Analyse**	3	3	2	3	-	2	3	3	3	2	3	2	2	3	3
CO5	**K-5 Evaluate**	2	3	2	2	1	2	3	3	3	2	3	1	-	3	3
CO6	**K-6 Create**	2	3	2	2	1	2	3	-	3	-	3	1	-	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -III /SKB- Core

(SKILL BASED CORE COURSE)- Any one

SKB- CORE : 3.2B -NUTRITION AND DIETETICS

L	T	P	C
4	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- recall the types of nutrients and their food value.
- understand the role of metabolism of various food stuffs.
- realize the importance of balanced diets and BMR.
- study of malnutrition, Nutrition related diseases.
- recommend special therapeutic diets for persons suffering from various diseases.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: recollect the classification and types of nutrients and food stuffs.

CO2: understand the nutritive value and metabolism of food materials.

CO3: determine the energy value and BMR and limitations.

CO4: perceive knowledge on balanced diet and its application and importance. to avoid deficiency diseases.

CO5: evaluate therapeutic diets and prepare diets to control and overcome diseases.

UNIT I
NUTRIENTS
Macronutrients and their function- Carbohydrates – Fats – Proteins -Water.

Micronutrients and their function: Vitamins and Minerals.

Nutritive value of the food stuffs: Cereals – Pulses – Vegetables – Fruits – Milk – Egg – Meat – Fish.

(11L)

UNIT II
ENRICHMENT OF FOOD
Parboiling of rice – process of parboiling and its uses.

Germination of cereals – process of germination,uses of sprouts & its nutritive value.

Metabolism of foodstuffs – protein, carbohydrate and lipid.

Food choice and preparation methods- Effect of cooking on protein, carbohydrate and fat content. Role of fibres in nutrition

Menu planning and meal pattern – vegetarian and non – vegetarian..

(13L)

UNIT III
BMR
Determination of energy contents of food – Bomb calorimeter.

BMR – Determination of BMR – using direct calorimeter and Benedict Methods, Roth basal metabolic apparatus – Factors affecting BMR.

(11L)

UNIT IV
BALANCED DIET & DEFICIENCY

Nutritional requirements of different age groups: Pre schoolers- Schoolers – Adolescents – Pregnant, lactating women and aged people.

Nutritional diseases – causes and prevention and dietary management of malnutrition, under nutrition and obesity.

Common nutritional deficiency diseases in India – Kwashiorkor – Marasmas –Anaemia-Goitre.

(15L

UNIT V
THERAPEUTIC DIET

Importance, Diet planning. Symptoms, causes, prevention and dietary management for Diabetes mellitus, Ulcer, Renal diseases, Hepatitis, Hypertension, aAherosclerosis, Gastro-intestinal disorders and Constipation.

(10L)

(TOTAL: 60L)

Books for reference

1. Poggy, S., Stanfield. Nutrition and Diettherapy. Ann Louise Gittleman. The Fat Flush Plan. Tata Mc Graw Hill Publishing Company Limited,444/1,Sri Embara Naicker Industrial Estate, Alapakkam, Porur,Chenn
2. Hellen Kowtaluk. Food for Today, Tata Mc Graw Hill Publishing Company Limited, 444/1,Sri EmbaraNaicker Industrial Estate, Alapakkam, Porur, Chennai

3.Shubhangini A. Joshi, Nutrition and Dietetics.T Tata Mc Graw Hill Publishing

Company Limited, 444/1,Sri EmbaraNaicker Industrial Estate, Alapakkam, Porur, Chennai.
4. Swaminathan, M. Food Science, Chemistry and Experiment.
5. Swaminathan, M. Principles of Nutrition and Dietetics.
6.You and Your food and its utilization, Manuscript.IGNOU.
7. Rajalakshmi, R. Applied Nutrition.
8. Sumathi, R. Mudambi and M.V. Rajagopal. Fundamentals of Food and Nutrition.
9. Stanley Davidson, Passmore, R. Nutrition and Dietetics
10. Fergos Clydesdate, M.. Food Nutrition and Health.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: III PART III: SKILL BASED CORE COURSE : 3.2B NUTRITION AND DIETETICS																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	2	1	1	1	-	3	3	2	-	1	2	1	1
CO2	**K-2 Understand**	3	3	2	2	1	2	1	3	3	3	2	2	3	1	1
CO3	**K-3 Apply**	3	3	3	2	2	2	2	3	3	3	2	2	2	1	3
CO4	**K-4 Analyse**	3	3	3	3	2	3	2	3	3	3	3	2	2	1	3
CO5	**K-5 Evaluate**	3	3	2	3	2	3	3	3	3	3	3	3	3	2	3
CO6	**K-6 Create**	2	2	2	2	2	3	2	2	3	2	3	3	2	1	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

B.Sc (CBCS) DEGREE EXAMINATION

Third Semester

Skill Based Elective

Time: 3 Hrs 3. 2B- **NUTRITION AND DIETETICS** Maximum: 75 marks

Part A (10x1=10marks)

Answer All Questions

Choose the correct answer

1.Osteomalacia is due to the deficiency of ---------- vitamin **Mapping level**

a. **D** b. A c. E d. B **(CO1) K1**

2.Cereals are rich source of **(CO1) K1**

a.**carbohydrate** b.protein c.mineral d.water

3.Sippy's diet is advisable for **(CO2) K2**

a. **ulcer** b. diabetes c. hepatitis d. renal disease

4.The end product of carbohydrate metabolism in anaerobic respiration is **(CO2) K1**

a. **pyruvic acid** b.glucose c.aminoacid d.starch

5. Identify the immediate source of energy **(CO3) K2**

a. cellulose b. starch c. **glucose** d. pectin

6.Basal metabolic rate of a person depend on **(CO3) K2**

a. **body weight** b. protein content c. mineral content d. energy value

7. High energy yielding food substance is **(CO4) K1**

a. carbohydrate b. cellulose c. protein d. **lipid**

8. Marasmus disease is due to deficiency of **(CO4) K1**

a.**Protein** b.Vitamins c. Minerals d. Fat

9.Polyuria and polydipsia are the symptoms of ------- disease **(CO5) K2**

a.hypertension b. **diabetes mellitus** c. ulcer d. hepatitis

10.Diabetes mellitus is due to the deficiency of **(CO5) K1**

a. glucagon b. thyroxine c. **insulin** d. adrenalin

PART B- (5x5=25 marks)

Answer all questions, choosing either (a) or (b)

11.a. Discuss the role of water in our body (Or) **(CO1) K4**

b.Explain the nutritive values of fruits

12.a.Describe the effect of cooking on fat (Or) **(CO2) K3**

b.What is meant by menu planning. Explain briefly

13.a.Explain the role of fibre in nutrition (Or) **(CO3) K4**

b.What are the factors that affect BMR?

14.a.Write short notes on under nutrition (Or) **(CO4) K3**

b.Give a brief account on nutritional requirements for adoloscents

15.a.Write short notes on the importance of diet in disease (Or) **(CO5) K4**

b.Explain the causes and dietary management for constipation

PART C- (5x8=40 marks)

Answer all questions, choosing either (a) or (b)

16.a.Write an account on fat soluble vitamins (Or) **(CO1) K3**

b.Explain the nutritive value of cereals and pulses

17.a. Examine the source of carbohydrates and their function (Or) **(CO2) K4**

b. Compare the vegetarian and non vegetarian meal pattern.

18.a.How will you determine the BMR using direct calorimeter (Or) **(CO3) K5**

b. Detemine the energy content of carbohydrate.

19.a. Define obesity. Explain the prevention and dietary management for it (Or)

b.Write an essay on common nutritional deficiencies in India **(CO5) K5**

20.a. Explain about the therapeutic diet and its importance (Or) **(CO6) K4**

b. Describe the symptoms, causes, prevention and dietary management for diabetes

MSU/2021-22/UG-Colleges/Part-IV (B.Sc. ZOOLOGY) SEMESTER -III /NME
(NON- MAJOR ELECTIVE) - Any one
NME COURSE: 3.3A- BEE KEEPING

L	T	P	C
2	--	--	1

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- know the knowledge of the types and life history of bees.
- understand the supply of food and arrangement of apiary.
- practice the capture of colony and maintenance.
- acquire the knowledge of modern bee keeping.
- insist the hygienic honey extraction and value of honey.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: recall the types of bees and identify the members of the colony.

CO2: acquire the knowledge of food of bees and relation with plants and apiary location and arrangement.

CO3: apply the principles on acquiring the bees and their behaviour and maintenance.

CO4: compare the primitive rearing methods and adopt modern methods in bee keeping and extraction of honey.

CO5: evaluate the properties and economic value of honey and marketing.

CO6: promote bee keeping as effective entrepreneur programme.

UNIT I

TYPES OF BEES

Comparative study of Rock bee, Indian bee, Little bee and Dammer bee – Life history of *Apis indica*. Queen, Drones and Workers – Identification, Salient features and Functions.

(6L)

UNIT II

FOOD OF THE BEES

Honey and pollen. Relationship of plants and bees. Arranging an apiary position – space – direction. Routine management- Seasonal management- Migratory bee keeping.

(6L)

UNIT III

ACQUIRING BEES

Care of newly captured colonies. Different kinds of cells- architecture of honey comb- Swarming - Supersedure. Diseases and enemies of bees and colony – Protection of the colony.

(6L)

UNIT IV

TYPES OF HIVES

Primitive hives – Different types. Advantages and disadvantages of primitive hives. Modern hives- Newton's bee hive and its architecture. Appliances used in Apiaries.

(6L)

UNIT V

HARVESTING AND MARKETING BEE PRODUCTS

Collection and Extraction of honey, preservation, storage, physical properties, chemical composition, nutritive value, medicinal values- Honey as Daily Food. Bee wax & Venom and Royal Jelly.

(6L) (TOTAL: 30L)

Books for reference

1. Bee Keeping in India – Sardar Singh- K.A.R, Delhi.
2. Bee keeping in South India – Cherian M.C. & Ramachandran, Govt.Press,Chennai.
3. Handbook of bee keeping – Sharma P.L. & Singh S.,Chandigarh.
4. Apiculture – Johnson J. & Jeyachandra, Marthandam, Tamil Nadu.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: III NON - MAJOR ELECTIVE COURSE : PART IV- COURSE: 3.3A- BEE KEEPING																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	2	1	2	2	2	3	2	-	2	2	3	2	2
CO2	**K-2 Understand**	2	3	3	1	2	2	3	3	3	-	2	3	3	3	3
CO3	**K-3 Apply**	2	3	3	2	2	1	3	3	3	2	2	3	3	3	3
CO4	**K-4 Analyse**	3	3	3	1	3	1	2	3	3	2	2	3	3	3	3
CO5	**K-5 Evaluate**	3	3	2	2	3	2	2	3	3	-	2	3	3	3	3
CO6	**K-6 Create**	2	3	2	2	3	1	3	2	3	-	3	3	2	2	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-IV (B.Sc. ZOOLOGY) SEMESTER -III /NME

PART IV- (NON-MAJOR ELECTIVE)- Any one

NME COURSE: 3. 3B- CLINICAL BIOLOGY

L	T	P	C
2	--	--	1

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- know the normal and abnormal condition of the body.
- understand the safety methodology on collection of samples.
- identify the correct procedure for analyzing the various samples.
- know how to apply the right and specific test for diseases.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: recall the difference between normal and abnormal conditions of the patients.

CO2: recognize the importance of testing and adopt suitable safety methods for sample collection.

CO3: apply the principles and correct procedure for analysis and collection of samples for diagnosis.

CO4: compare and interpret the results and observations of the reports.

CO5: encourage to provide community service by keeping clinical laboratory.

UNIT I

INTRODUCTION

Normal and Abnormal conditions of body – Symptoms – Samples to be collected for analysis – diagnosis – Instruments used in the analysis - Sterilization.

(6L)

UNIT II

URINE ANALYSIS

Collection and preservation of sample and chemical estimation. Protein, Urea, Glycemia, sediments and casts, impaired renal function and clearance test..

(6L)

UNIT III

ESTIMATION OF GASTRO INTESTINAL CONTENTS

Saliva constituents, Collection and estimation of Gastric juice, Secretion of liver, Duodenal contents and Pancreatic function tests.

(6L)

UNIT IV

CLINICAL HAEMATOLOGY

Ways of obtaining blood- Haemoglobin estimation. Cell counting (DC/ TC), Estimation of Erythrocyte sedimentation test (ESR), pathological, physiological and hereditary disorders, Blood banking, Blood grouping, and typing, Glucose Tolerance Test (GTT), Impaired Glucose Tolerance Test, ELISA test.

(7L)

UNIT-V
FERTILITY TEST

Semen analysis and pregnancy test, RIA test- Agglutination test- Morphological variations – Types- Count and Abnormalities.

(5L)

(TOTAL: 30L)

Books for reference

1.Medical laboratory techniques- R. Sood
2.Text book of preventive medicine-J.E Park, Benansidar Bhalot
3. Introduction of medical laboratory technology-Baker, F.J.Silverton

4. Medical laboratory technology- Lynch.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: III PART IV: NON-MAJOR ELECTIVE COURSE : 3. 3B- CLINICAL BIOLOGY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	1	2	2	1	-	3	2	2	1	-	-	1	-
CO2	**K-2 Understand**	3	3	2	2	3	2	1	3	3	2	2	2	3	2	2
CO3	**K-3 Apply**	3	3	2	2	3	2	2	3	3	2	3	2	2	2	2
CO4	**K-4 Analyse**	3	3	3	2	3	2	1	3	3	3	3	2	3	2	3
CO5	**K-5 Evaluate**	1	3	3	2	3	3	2	3	3	3	3	2	2	2	3
CO6	**K-6 Create**	1	1	2	2	2	3	2	2	3	3	2	2	3	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -IV /Core

CORE COURSE: 4. 1 - GENETICS

L	T	P	C
4	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- learn the basic principles of inheritance at the molecular, cellular and organismal levels.
- understand causal relationships between molecule/cell level phenomena -"modern" genetics and organism-level patterns of heredity -"classical" genetics.
- learn the mechanism of Mutation and will able to understand how mutations bring changes in an organism.
- understand the human genetics and modern approaches in gene concept.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: analyse the basic principles of Mendelian inheritance and Genic interaction.

CO2: construct Chromosome map using crossing over.

CO3: explain the concept and factors involved in gene mutation.

CO4: assess the impact of chromosomal abnormalities in human.

CO5: relate Eugenics & Euthenics and Inbreeding & Outbreeding.

CO6: apply Hardy-Weinberg law in a population and find out the percentage of heterozygotes.

CO7: combine the knowledge about gene transfer techniques helps to develop new techniques in biotechnology

UNIT I

MENDELIAN GENETICS

Mendelian Laws of Inheritance: Monohybrid experiment – Dihybrid experiment- Back Cross and Test Cross. **Genic Interaction:** Non-Allelic gene interaction (Complete dominance - Incomplete dominance – Co-dominance), Allelic gene interaction (Complementary genes - Supplementary genes - Lethal genes) and **Epistasis**. **Multiple Alleles:** ABO Blood Group – Rh Blood group**. Multiple Genes:** Skin colour of Man..

(12L)

UNIT II

CHROMOSOMES

Linkage - Crossing over - Mechanism and theories. Chromosomal maps & its construction. Chromosomal Aberrations, Gene Mutations– Physical & Chemical mutagens – DNA repair.

(12L)

UNIT III

INHERITANCE

Sex determination in Drosophila and Man. **Sex Linked Inheritance:** X- linked (Haemophilia and Colour Blindness) & Y- linked (Hypertrichosis) inheritance – Genic Balance theory - Barr bodies. **Chromosomal variation & Non-disjunction:** Euploidy, Aneuploidy, Monosomy, Trisomy - Klinefelter's, Turner's & Down's syndromes – Cytoplasmic inheritance. (12L)

UNIT IV

HUMAN GENETICS

Inborn errors of Metabolism: Phenylketonuria, Alkaptonuria, Albinism, Sickle cell anaemia. Pedigree Analysis - Eugenics – Euthenics - Genetic Counselling - Inbreeding and Out breeding - Hardy-Weinberg Law and its Applications.

(12L)

UNIT V

MODERN GENETICS

Concept of Gene: Cistron – split gene – promoter – repetitive DNA – Transposons. **Bacterial Genome:** Transformation – Conjugation – F- factor – Sex duction – Transduction – Generalised & Specialised - Plasmids. **Operon Concept** (Lac & Tryp operon- brief outline only).

(12L)

(TOTAL: 60L)

Books for reference

1.Gardner EJ Principles of genetics. London, UK, John Wiley & Sons, Inc.

.2.Meyyan RP Fundamendals of Genetics, Saras Publication Nagercoil.

3.Primrose SB, Twyman R. Principles of gene manipulation and genomics. John Wiley & Sons; 2013 May 28.

4.Strickberger MW, Genetics, Pearson publishers.

5.Verma P.S & Agarwa,l V.K Genetics, S. Chand Publishers, New Delhi

6. Farnsworth : Genetics (Harper and Row).

7. P.K.Gupta: Genetics (Rastogi Publications)
8. Altonburg, E: Genetics (Oxford & IBH publishing company)
9. Burns G.W.: The Science of Genetics (Mac Millan)
10. A.C.Pai: Foundations of Genetics (Mc Gaw –Hill)
11. J.A.Serra: Modern Genetics (3 Volumes)
12. Sinnot, Dunn and Dobzhansky: Principles of Genetics (McGraw Hill)

COs at Cognitive level and mapping with POs and PSOs

SEMESTER IV **PART III- CORE COURSE: 4. 1 - GENETICS**																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-4 Analyse**	3	3	1	3	2	1	1	3	3	1	1	3	3	1	0
CO2	**K-3 Apply**	3	3	1	3	1	2	1	3	3	1	1	3	3	1	1

CO3	**K-2 Understand**	3	3	3	3	3	1	2	3	3	1	1	1	3	1	0
CO4	**K-5 Evaluate**	3	3	3	3	1	2	1	3	2	1	1	1	3	2	2
CO5	**K-1 Remember**	3	3	3	1	3	0	0	3	3	1	1	2	3	1	0
CO6	**K-3 Apply**	3	3	3	1	1	0	0	3	3	1	1	3	3	1	2
CO7	**K-6 Create**	3	3	1	3	1	3	1	3	3	1	1	3	3	2	1

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -IV /Core Practical

CORE PRACTICAL IV: GENETICS

L	T	P	C
--	--	2	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the student to

- prove the monohybrid and dihybrid ratio of Mendelian laws with colour beads.
- elucidate the blood group inheritance among students.
- test the inheritance of simple mendelian traits in student population.
- study the polygenic inheritance with height and weight of the students.
- observe the models and charts to know their genetic importance.

COURSE OUTCOMES (Cos):

On successful completion of the practical course the student will be able to

CO1: explain the segregation and assortment of chromosomes during inheritance of the characters with colour beads and prove chi-square test.

CO2: describe and prove the inheritance of simple mendelian traits.

CO3: develop the skill to interpret the polygenic inheritance with quantitative traits.

CO4: analyse the pattern of inheritance of ABO and Rh grouping in students.

CO5: design an experiment to explain the genetic concepts.

PRACTICALS

1. Breeding Experiment: Chi Square test to be illustrated with beads/ coin tossing a) Monohybrid Cross b) Dihybrid Cross.
2. Observation of Simple Mendelian traits in man – to be recorded.
3. Observation and study of Polygenic inheritance of quantitative traits to be interpreted in graphs:-a) height of students/ b) weight of students / c) length of shells / d) length of pods.
4. Blood group to be analyzed in a population with a minimum of 30 students.
5. Spot Tests: Models of genetic significance to be studied *E.coli*, T_4 Phage- Down's syndrome, Klinefelter's syndrome, Turner's syndrome, Sex -linked inheritance : Colour Blindness, Haemophilia, Hypertrichosis.
6. Culture of Drosophila and observation of its life cycle and mutants

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: IV **PART III: CORE COURSE PRACTICAL IV : GENETICS**																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-2 Understand**	3	2	2	3	2	1	1	2	3	3	3	3	3	3	1
CO2	**K-3 Apply**	3	2	2	3	2	1	1	3	3	1	3	2	2	2	1
CO3	**K-4 Analyse**	3	3	2	2	2	1	1	3	2	1	-	1	-	3	1
CO4	**K-5 Evaluate**	3	3	1	3	2	1	1	3	3	1	=	1	2	3	1
CO5	**K-6 Create**	2	3	1	2	3	1	1	3	2	1	-	2	2	3	3

Strongly Correlated (3);Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

B.Sc (CBCS) DEGREE EXAMINATION
Fourth Semester
ZOOLOGY
Core course 4.1- GENETICS
(For those who joined in 2021-2022)

Time : 3 hours Maximum : 75 marks

PART -A (10 × 1 = 10 Marks)
Answer ALL questions
Choose the correct answer. Mapping level

1.The ratio of back cross is **(CO1) K1**

(a) **3 : 1** (b) 1 : 1
(c) 1 : 2 : 1 (d) 2 : 1

2. The superiority of the hybrid over the parent is called as **(CO1) K2**
(a) Test cross (b) Back cross
(c) **Heterosis** (d) Crossing over

3. Crossing over occurs at the stage of **(CO2) K1**
(a) Leptotene (b) **Pachytene**
(c) Diplotene (d) 'S' phase

4. The term mutation, was first coined by **(CO2) K1**
(a) Mendel (b) **Hugo-de-Vries**
(c) Bateson (d) Darwin

5. Klinefelter's syndrome is by ---------- chromosomes **(CO3) K2**
(a) 44+XXY (b) 45+XX
(c) 44+XO (d) **45+XXY**

6. Hypertrichosis is ---------- inheritance **(CO3) K1**
(a) **Y – Linked** (b) X – Linked
(c) XY – Linked (d) None

7. Study on the importance of Human race is called **(CO4) K1**
(a) Genetics (b) Eugenics
(c) **Euthenics** (d) Euphenics

8. A disease due to inborn errors of metabolism is **(CO4) K1**
(a) Hemophilia (b) Color blindness
(c) Down syndrome (d) **Albinism**

9. Gene refers to the portion of **(CO5) K2**
(a) **DNA** (b) Amino acids
(c) Fatty acids (d) Protein

10. F factor contains **(CO5) K1**
(a) DNA (b) RNA
(c) hnRNA (d) **Both (a) and (b)**

PART-B (5 X 5 = 25 Marks)
Answer All questions choosing either (a) or (b)
Each answer should not exceed 250 words

11. (a) Comment on Mendel's laws of heredity. (or) **(CO1) K3**
(b) Write about Rh factors role in human blood grouping.

12. (a) Mention the mechanism of Linkage. (or) **(CO2) K3**
(b) Describe briefly about Mutagens.

13. (a) Discuss the genetic basis of Haemophilia. (or) **(CO3) K4**
(b) What are Barr bodies? Explain its role.

14. (a) Comment on Euthenics. (or) **(CO4) K2**
(b) Write about Phenylketonuria.

15. (a) Elucidate the genetic importance of Transposons. (or) **(CO6) K5**
(b) Give an account on Cistron.

PART-C (5 X 8 = 40 Marks)
Answer All questions choosing either (a) or (b)
Each answer should not exceed 600 words

16. (a) Explain Mendel's dihybrid cross (or) **(CO1) K2**
(b) Write a detailed account on interactions of non - allelic genes.
17. (a) Explain in detail about the mechanism of crossing over. (or) **(CO3) K4**
(b) Describe in detail about construction of chromosome map .
18. (a) Discuss about chromosomal variations due to non - disjunction. (or) **(CO4) K4**
(b) Examine the genetics of cytoplasmic inheritance with suitable examples.
19. (a) Enlist the essence of eugenics in human welfare. (or) **(CO3) K5**
(b) Explain about Hardy-Weinberg equilibrium.
20. (a) Elucidate the methods of gene transfer in Bacterial genome. (or) **(CO5) K6**
(b) Discuss in detail about the Lac operon concept.

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -IV /SKB- Core

(SKILL BASED CORE SUBJECTS) -Any one
SKB- CORE COURSE : 4.2A
BIOPHYSICS AND BIOINSTRUMENTATION

L	T	P	C
4	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- know the basic concepts of atoms, molecules, chemical bonds and thermodynamicsstudy the role of bioenergetics.
- understand the methods of various instrumentations related to biological systems and functions.
- learn the concepts of photobiology in biology.
- study the working principle and applications of instruments used in the biological field.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: remember the basic concepts of biophysics.

CO2: understand the energy formation and bioenergetics.

CO3: apply the principles of photobiology on bioluminescence.

CO4: assess the importance of various instruments on bio assay.

CO5: evaluate the applications of radiography in biological study.

CO6: gain confidence to establish a well equipped biological laboratory for bioassay.

UNIT I

BIOPHYSICS

Scope and Method – Atoms – Molecules – Molecular Interactions – Chemical bonds – Primary chemical bonds – Secondary chemical bonds. Principles of Thermodynamics – Laws of Thermodynamics – Enthalpy – Entropy – Living systems and energy changes.

(12L)

UNIT II

BIOENERGETICS

Energy and Work – Energy Transformation – ATP – Bioenergetics – Structure of ATP – Formation of ATP – NADP – Structure – NADP / NADPH Redox couple – Mitochondrial bioenergetics – Chloroplast bioenergetics. Membrane conductivity – Diffusion – Active transport – Osmosis – Electric conductivity.

(12L)

UNIT III

PHOTOBIOLOGY

Nature of light and its properties – Absorption and Emission Spectra – action spectrum, Refractive index – Huyge's Principle – Polarized light – Solar radiation – UV – Infrared – De-excitation- Bioluminescence – Fluorescence – Phosphorescence.

(11L)

UNIT IV

INSTRUMENTATION

Microscopy – Principle and application of Electron Microscope. Basic Instruments – Principle and applications of pH meter and Colorimeter- Centrifugation – Principle and Types – Chromatography – Principle – Types – Paper, Ion exchange, HPLC and applications

(11L)

UNIT V

LABELLING TECHNIQUES

Isotopes, Radioactivity, Radioactive decay, half – life, autoradiography, biological use of radioactivity, Radioactivity Counter – Principle – Types – Geiger Muller – Scintillation Counter.

Electrophoresis: Principle – Types – Agarose Gel electrophoresis, Polyacrylamide gel – Sodium Dodecyl Sulphate Polyacrylamide gelelectrophoresis – Applications

PCR Technology: Working mechanism of PCR- applications

Gel Doc: Principle – Working mechanism. Lyophiliser – Principle – Working mechanism – applications.

(14L)
(TOTAL 60L)

Books for Reference

1. Saleel Bose: Elements of Biophysics.
2. Casey: Biophysics – Concepts & Mechanism.
3. Vasanthapattabhi N. Gautham: (Narosa publishing House) – Biophysics.
4. Jeyaraman, K. : Laboratoy Manual in Biochemistry. New Age International publishers.
5. Kalaichelvan, P.T: A Laboratory Manual, MJP Publishers,47, Nallathambi Street, Triplicane, Chennai 600 005.
6. Gurumani, N: Research Methodology for Biological Sciences.MJP 47, Nallathambi Street, Triplicane, Chennai 600 005.
7. Palanivelu, P.Analytical Biochemistry and Separation Techniques. A Laboratory Manual for B.SC and M.SC Students.Department of Molecular Biology, M.K.University, Madurai-625 021.
8. L.Veerakumari, Bioinstrumentation MJP Publishers,47, Nallathambi Street, Triplicane,Chennai 600 005

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: IV **PART III: SKILL BASED CORE COURSE: 4.2A BIOPHYSICS AND BIOINSTRUMENTATION**																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	2	2	3	-	1	3	3	2	2	3	3	2	2
CO2	**K-2 Understand**	3	3	3	2	2	-	3	3	3	2	2	3	2	3	2
CO3	**K-3 Apply**	3	3	3	2	2	-	3	2	3	3	3	3	2	3	3
CO4	**K-4 Analyse**	2	3	3	2	1	-	2	2	3	3	2	3	2	3	3
CO5	**K-5 Evaluate**	2	2	2	1	1	-	3	3	3	3	3	3	-	3	3
CO6	**K-6 Create**	-	2	2	1	2	1	3	2	3	1	3	3	-	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -IV /SKB -Core

(SKILL BASED CORE COURSE) -Any one

SKB- CORE COURSE: 4.2B-VERMITECHNOLOGY

L	T	P	C
4	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- gain knowledge of agro based small scale industries using vermicompost preparation.
- understand the environmental conservation process and its importance, pollution control, biodiversity and protection of earthworms through vermiculture.
- assure that Vermitechnology is used to control environmental pollution and global warming.
- contribute their knowledge to develop organic fertilizer with rural and urban biodegradable wastes using the Earthworms.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: find out Vermicomposting is an eco-friendly, economically and socially acceptable technology.

CO2: illustrate that Vermitechnology is useful for stabilization and recycling of both industrial and domestic organic waste.

CO3: utilize Vermitechnology to improve the soil texture, soil aeration, improve the water retention capacity in the soil.

CO4: apply Vermitechnology to conver rural and urban garbage into nutrient rich ecofriendly organic manure.

CO5: apply the ethical principles and commit to pledge responsibilities to protect and save environment.

CO6: improve Vemitechnology to manufacture the vermicompost in small scale industry by which the economy of the farmer is improved. It provides the employment opportunity in rural and urban areas.

CO7: justify and prove that the Earthworms are having the capacity to observe heavy metals into their body tissues and converting the soil without heavy metals.

UNIT I

TAXONOMY OF EARTHWORM

Morphological and anatomical – Classification of earthworms – Food habits – Digestive system – Excretion – Reproduction and Life cycle – Earthworm as farmer's friend.

(11L)
UNIT II
TYPES OF EARTHWORM

Exotic and native species – South Indian and North Indian species used in Vermicomposting – Collection and Preservation of earthworms for vermicomposting – Culture techniques of earthworms.

(11L)
UNIT III
VERMICOMPOST PRODUCTION

Requirements – Different methods of Vermicomposting – Heap method – Pot method and Tray method – changes during Vemicomposting.

(11L)
UNIT IV
ROLE OF EARTHWORMS IN SOIL FERTILITY

Use of Vermicompost for crop production – Use of earthworms in land improvement and land reclamation – Economics of Vermicompost and Vermiwash production. Earthworms as animal feed – Medicinal value of earthworm meal – Roles of Earthworms in Solid Waste, Sewage and faecal waste management and Vermifilters. Earthworms as bioreactor.

(15L)

UNIT V

INTERACTIONS OF EARTHWORMS WITH OTHER ORGANISMS

Influence of chemical inputs on earthworm activities – Large scale manufacture of Vermicompost, packaging of vermicompost and its marketing – Financial supporting – Government and NGOs for vermiculture work.

(12L)

(TOTAL 60)

Books for Reference

1. Invertebrate Zoology – Ekambaranatha Ayyar.
2. Earthworm in Agriculture – S.C. Talashikar and Dosani, Agrobios Publications, Near Nasarani Cinema, Jodhpur, 342 002.
3. Vermicompost for sustainable Agriculture – P.K. Gupta Agrobios 2nd Edition.
4. Organic Farming for sustainable Agriculture – A.K.Dahama,Agrobios. 5.A Hand book of Organic farming – A.K.Sharma.Agrobios publication.
6. Earthworm ecology – Clive A. Edwards St. Lucie press – CRC Press Washington DC.
7. Biology of Earthworm - Edward and Lofti – Chapman and Hall Publication.
8. Vermicology – Sultan A. Ismail – Orient Longman Press.
9. Vermiculture Biotechnology – U.S. Bhawalkar BERI, PUNE

COs at Cognitive level and mapping with POs and PSOs

SEMESTER IV **PART III: SKILL BASED CORE COURSE - 4.2B: VERMITECHNOLOGY**																
CO	**COGNITIVE LEVEL**	**PO**							**POS**							
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
CO1	**K1 Remember**	3	3	3	3	2	3	1	3	3	3	3	3	3	2	1
CO2	**K2 Understand**	3	3	3	2	2	3	3	3	3	3	3	2	3	3	3
CO3	**K3 Apply**	3	2	3	3	3	2	2	3	3	3	2	3	2	3	2
CO4	**K3 Apply**	3	3	3	2	3	2	3	2	3	3	1	3	3	3	1
CO5	**K3 Apply**	3	2	3	3	3	3	2	3	2	2	3	3	3	2	1
CO6	**K4 Analyse**	2	3	3	2	3	3	1	3	3	3	2	2	3	1	1
CO7	**K5 Evaluate**	3	3	2	3	1	3	2	2	3	2	3	3	2	3	1

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

Manonmaniam Sundaranar University-Tirunelveli-12

B. Sc. ZOOLOGY PROGRAMME

MODEL QUESTION

SEMESTER IV

SKILL-BASED ELECTIVE 4.2B - VERMITECHNOLOGY

Time: 3 hrs Maximum: 75 marks

PART A-(10 X 1 = 10 marks)

Answer all questions

Choose the correct answer
Mapping level

1. Earthworms belong to the Phylum.
   (CO1) K1
   a) Protozoa b) Arthropoda c) **Annelida** d) Aschelminthus
2. The food habit of earthworm is
   (CO1) K2
   a) **detritus** b) grazing c) parasitic d) saprophytic
3. The earthworm popularized by Savigny is
   (CO2) K1
   a) **Eisenia fetida** b) Lumbricus rubellus c) Lampito marisi d) Perionyx excavatus
4. Which one of the following organ is present in earth worm.
   (CO2) K2
   A) leg b) **typhlosole** c) tentacle d) teeth
5. The preferred species for composting of urban waste is
   (CO3) K1
   a) Pheretima elongate b) Lampito mauriti c) **Eisenia fetida** d) Eudrillus rubellus
6. M.S. Swaminathan Foundation is situated in
   (CO3) K1
   a) Karnataka b) Orissa c) **Tamil Nadu** d) Andra Pradesh
7. The temperature required for making quality vermicompost is
   (CO4) K1
   a) 15 – 20°C b) **25-30°C** c) 5-10°C d) 0-5°C

8. The percentage of nitrogen in earthworm casting is
(CO4) K2
a) **3%** b) 2% c) 1% d) 5%
9. The institute which has developed cost effective package to promote vermi activity is
(CO5) K1
a) **BERI** b) CECRI c) NEERI d) AQUATER
10. Association for promotion of organic farming is located in
(CO5) K1
a) Mysore b**) Bangalore** c) Dharward d) Bijapur

PART B (5 X 5 =25 marks)

Answer all questions, choosing either (a) or (b) about 250 words

Draw diagrams wherever necessary

11. a) Explain about different species of earthworms OR **(CO1) K3**
b) Narrate the general characters of the class Oligochaeta.
12. a) Discuss briefly the methods of Vermiculture. OR **(CO3) K4**
b) Enumerate the characters used for earthworm species selection for culture.
13. a) Explain the procedure for the preparation of vermibed. OR **(CO3) K3**
b) Explain the culture of earthworms in Horticultural gardens.
14. a) Explain how the vermicompost increases the soil fertility. OR **(CO5) K4**
b) Comment an specific qualities of vermicomposting.
15. a) Write a notes on Bhawalkar Earthworm Research Institute, Pune in the development of Vermicomposting. OR
b) "Earthworm are Farmers' friend -Justify' **(CO6) K5**

PART C-(5 X 8 =40 marks)

Answer all questions, choosing either (a) or (b) about 600 words

Draw diagrams wherever necessary

1. a). Describe the life cycle of earthworm with examples. OR **(CO2) K4**
b) Explain Earthworm as bioreactor
2. a) Describe the culture techniques of earthworms. OR **(CO3) K3**
b) Describe the methods of collection and preservation of earthworms.
3. a) Explain briefly the different methods of vermicomposting. OR **(CO4) K4**
b) Give an account of biological changes occurs during vermicomposting.
4. a) Evaluate the economic importance of earthworms and organic farming.OR **(CO6) K5**
b) Illustrate and emphasise role of Earthworms in land improvement reclamation.
5. a) Describe the methods of Vermiwash production and its uses. OR **(CO5) K4**
b) Discus the role of Government and its financial supports for the development of Vermiculture practices.

MSU/2021-22/UG-Colleges/Part-IV (B.Sc. ZOOLOGY) SEMESTER -IV /NME

(NON -MAJOR ELECTIVE COURSE) –Any one

NME COURSE : 4.3A - PUBLIC HEALTH AND HYGIENE

L	T	P	C
2	--	--	1

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- understand the physical, mental and social health.
- know the safer disposal of various wastes.
- create awareness about first aid and accede.nts
- improve the awareness about healthy and hygienic practices.
- instruct the health standard and status and schemes.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: relate the concepts, definition and principles of health and hygiene in our daily life.

CO2: illustrates the hygienic uses of water and make use of standard housing recommendations.

CO3: identify the safety disposal of excreta and practise it.

CO4: classify the diseases as communicable and parasitic diseases.

CO5: assesses the safety procedures for health and hygiene.

CO6: propose solution for the health related problems/issues in the light of

eradication schemes of government and the involvement of NGOs.

UNIT I

DEFINITION AND BASICS

Physical, Mental, Social and Positive health – Quality of life Index. Nutrition and Health – Food hygiene – Food toxicants. Population explosion in India – Birth control measures. **(6L)**

UNIT II

ENVIRONMENT AND HEALTH

Water – Sources of water – Uses of water. Water borne diseases – Cholera – Ascariasis. Standards of Housing – Ventilation. **(6L)**

UNIT III
EXCRETA DISPOSAL & FIRST AID

Importance – Methods of excreta disposal. Sanitary health measures during fares and festivals. First aid with reference to accident. **(6L)**

UNIT IV
COMMUNICABLE DISEASE

Viral diseases: AIDS, Rabies. Bacterial diseases: Tuberculosis, Typhoid. Protozoan diseases: Amoebiasis. Helminth diseases: Filariasis.

(6L)

UNIT V
HEALTH SITUATION IN INDIA

Health problems – Primary health care in India – PHC – National Programmes – National AIDS control – National Malaria Eradication Programme – National Tuberculosis Control Programme.

(6L)

(TOTAL 30L)

Books for Reference

1. Anderson R.Cliford. Your Guide to Health.
2. Basu, S.C. Preventive and Social Medicine.
3. Goel, S.O.L. Public Health Administration.

4. Harold Shoryock and Hubert O. Swartout. You and Your Health illustratedDealing with Diseases.
5. Park, K. & Park. S. Text Book of Preventive and Social Medicine.BanarsidasBhanot Publishers,1167 PremNager, Jabalpur – 482001.
6. Ramarao, V.First Aid in accidents. Sri Krishna brothers, Thambu Chetty Street, Chennai.
7. Sanitarians Hand Book. Theory and Administrative Practice. Pearles Publications, New

COs at Cognitive level and Orleans, USA.**mapping with POs and PSOs**

SEMESTER: IV

PART IV: NON- MAJOR ELECTIVE COURSE

NME COURSE: 4.3A - PUBLIC HEALTH AND HYGIENE

CO	COGNITIVE LEVEL	PO							PSO							
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
CO1	K-1 Remember	2	3	2	2	2	3	1	3	3	3	2	-	3	2	2
CO2	K-2 Understand	3	3	2	-	3	3	2	3	3	2	3	-	3	3	2
CO3	K-3 Apply	2	3	2	2	3	3	2	3	3	3	3	2	3	2	3
CO4	K-4 Analyse	2	2	2	2	3	3	3	3	3	3	3	2	2	2	3
CO5	K-5 Evaluate	2	2	2	3	3	2	2	3	2	2	3	2	-	3	3
CO6	K-6 Create	-	2	1	3	2	3	3	2	2	3	1	2	3	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MODEL QUESTION PAPER

NON MAJOR ELECTIVE 4.3A - PUBLIC HEALTH AND HYGIENE

IV Semester

Time: 3 Hrs **Max.Marks:75**

SECTION A (10X1=10 Marks)

Choose the correct answer **Mapping level**

1. Social medicine was first introduced by **(CO1) K1**
   a.John Crant b. Jules Querini c. Alfred Berlin d.Auxley Joseph
2. Scurvy is the deficiency disease of --------- **(CO1) K2**
   a.Vitamin A b Vitamin D c. Vitamin C d.Vitamin K
3. Records maintained in Primary Health Centres are **(CO2) K1**
   a.Record of Birth b. Record of Death c. Record of Services d. All of these
4. MBRT is used to check ------hygiene **(CO2) K1**
   a. Egg b. Meat c. Milk d.Fruits and vegetables
5. The causative agent of AIDS is **(CO3) K2**
   a.MIV b.HIV c. HPV d. BPV
6. The minimum distance between latrine and water source must be **(CO3) K1**
   a.5 meters b. 10 meters c. 15 meters d. 20 meters
7. Rabies is transmitted through ---------- **(CO4) K2**
   a. Mosquito b. Tse tse fly c. Rats d. Infected dogs
8. ---------- disease is resulted from Malnutrition . **(CO4) K2**
   a. Obesity b Diabetes c. Marasmus d. Hepatitis
9. Identify the irth control measure for male **(CO5) K1**
   a. Vasectomy b.Tubectomy c. Contraceptive pills d. Copper- T
10. Ozonization is used for **(CO5) K1**
    a. air treatment b. water treatment c. water purification d. Air purification

SECTION – B (5X5=25Marks)

Answer all the questions choosing either (a)or (b)

11. a. Write a brief account on physical and mental health **(CO1) K3**

OR

b. Write short notes on quality of life index

12. a. Explain water as the Basic Health Need **(CO2) K3**

OR

b. Explain in brief about a) Ascariasis b) Cholera

13. a. Comment on the importance of excreta disposal **(CO3) K5**

OR

b. How will you employ first aid for an road accident?

14. a.Write an essay on the causative agent, symptoms, treatment and prevention of Rabies

OR **(CO5) K4**

b. Explain the pathogenicity of Filariasis

15. a. Write about the prevention and eradication of TB in the national level **(CO6) K5**

OR

b. Write about National Malaria Eradication programme

SECTION – C (5X8=40Marks)

Answer all the questions choosing either (a) or (b)

16. a. Write an essay on the importance of Environment on health **(CO1) K4**

OR

b. Describe various birth control measures.

17. a. Write any two water borne diseases with reference to pathogenesis, symptoms and treatment **(CO2) K4**

OR

b. Give an account on standards and human requirement in a house for healthy living

18. a. Analyse the health measures to be taken in to account festival and fairs **(CO3) K5**

OR

b. Discuss the methods adopted for excreta disposal

19 a. Write an elaborate account on protozoan diseases . **(CO4) K5**

OR

b. What is AIDS? Explain the methods adopted to control it by the government.

20. a. Explain the components of National Malaria Eradication Programme **(CO6) K6**

OR

b. Write an essay on health situation in India

(NON- MAJOR ELECTIVE) –Any one

NME COURSE: 4.3B - COMMUNITYAND SOCIAL PREVENTIVE MEDICINE

L	T	P	C
2	--	--	1

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- know the meaning and concept of community health and medicine.
- educate the cause and effects of drug abuse and alcoholism.
- aware about the sexually transmitted diseases.
- understand the dangers of child labour.
- realize the problems of old age.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: relate the meaning and concept of the community health and medicine in practical life.

CO2: explain the causes and impact of drug addiction and alcoholism.

CO3: apply the knowledge of sexually transmitted disease to prevent and control.

CO4: analyse the root cause of child labour and adopt strategies to abolish.

CO5: evaluate the problems of old age.

CO6: design a model project to analyze the local situation.

UNIT I

COMMUNITY AND HEALTH

Meaning and concept- Biomedical, Ecological, Psychological, Social and Holistic. Determinants of health & Indicators of health. Concept of community health, Role of primary health centers.

(6L)

UNIT II

DRUG ADDICTION

In India today –incidence among college students-common drugs in vogue- their side effects, control and management of drug addiction.

ALCOHOLISM

Its effect on various organs like heart, lungs, liver, pancreas, brain and intestine-chronic alcoholism – alcoholic withdrawal syndrome - its control and treatment.

(6L)

UNIT III

SEXUALLY TRANSMITTED DISEASES

Gonorrhoea- Syphilils – AIDS - Causative agent, causes - symptoms-diagnosis - treatment and control measures.**(6L)**

UNIT IV

CHILD ABUSE

Definition-causes-effects-Legal measures for eradication. **(6L)**

UNIT V

PROBLEMS OF OLD AGE

Concept of ageing. H**o**using and health care of the aged. Problems – Cardiovascular - alimentary –Locomotion and joints-welfare service provided to the aged by the Government.

(6L)

(TOTAL 30L)

Books for Reference

1. Social Problems in India – Ram Akuja.
2. Social Preventive Medicine – Park & Park.
3. Ageing and Aged – Paul Chowthry.
4. Indian Social Problem –G.R. Madan

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: IV PART IV: NON-MAJOR ELECTIVE COURSE NME COURSE :4.3B - COMMUNITYAND SOCIAL PREVENTIVE MEDICINE																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	2	-	1	2	1	3	2	2	2	1	2	3	2
CO2	**K-2 Understand**	2	3	2	2	2	3	1	3	3	2	2	1	3	3	2
CO3	**K-3 Apply**	2	3	2	2	1	3	2	3	3	3	2	2	3	3	3
CO4	**K-4 Analyse**	2	3	3	2	2	3	2	3	3	3	3	2	3	2	3
CO5	**K-5 Evaluate**	-	1	1	-	2	2	1	2	3	2	3	2	3	2	3
CO6	**K-6 Create**	-	-	1	-	3	2	1	2	3	2	2	2	2	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -V /Core

CORE COURSE: 5.1 - DEVELOPMENTAL ZOOLOGY

L	T	P	C
5	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- develop critical understanding to realise how a single celled fertilized egg becomes an embryo and become adult.
- understand the three important processes of cell division, cell differentiation and morphogenesis.
- get awareness about the relevance of developmental biology in medicine and its role in development of diseases.
- acquire knowledge on the life cycle and metamorphic stages in animals.
- determine the factors affecting embryogenesis and methods and gain knowledge on treatment and prevention of diseases.

COURSE OUTCOMES (COs)

On successful completion of course the student will be able to

CO1: find the processes right from fertilization of a single cell egg to the formation of a well structured and functional multicellular organism.

CO2: understand and gain knowledge about the developmental stages like fertilization, cleavage and gastrulation.

CO3: compare the human embryo development to other animals and the regeneration, metamorphosis, transplantation and differentiations of stem cells in the organisms.

CO4: identify the integrative aspects of building of organisms and examine the developmental abnormalities and other conditions such as cancer.

CO5: analyse the developmental biology as a key subject in Zoology and justify it as a

motor for research, in the human diseases and fertility.

CO6: assume and conclude that the embryonic development provides a thorough knowledge to study other subjects like genetics, evolution, physiology, cell and molecular biology etc.,

CO7: determine the mechanism and principles to develop an embryo.

UNIT I

GAMETES & FERTILIZATION

Basic concepts of Developmental Zoology- Structure & types of Spermatozoa and egg-Spermatogenesis –Oogenesis. Fertilization: mechanism and significance –Parthenogenesis. **(15L)**

UNIT II

BLASTULATION & GASTRULATION

Cleavage : Patterns – Blastulation- Morphogenetic movements -Gastrulation , Fate map in frog **(15L)**

UNIT III

ORGANOGENESIS

Development of Brain and Heart in Frog. Development of Pronephric, Mesonephric & Metanephric kidneys.

Foetal membranes in Chick and Placentation in Mammals. **(15L)**

UNIT IV

APPLIED EMBRYOLOGY

Organizer concept – Mechanism of induction and competence. Nuclear transplantation in Acetabularia-Teratogenesis –Regeneration: types and mechanism. Embryonic stem cells and its significance.

(15L)

UNIT V

EMBRYOLOGICAL TECHNIQUES

Infertility: causes and treatments- Assisted Reproductive Technology: Artificial Insemination-IVF and test tube baby - Embryo transfer. Twins - Erythroblastosis foetalis – Amniocentesis. Birth control.

(15L)

(TOTAL 75L)

Books for reference

1.Arumugam NA Text Book of Embryology, Biotechnology. Saras Publication Nagercoil.

2.Balnisky BI An Introduction to Embryology, W.B. Saunders and Co.

3.Berril NJ, Kars G (1986). Developmental Biology, McGrawHills

4.Gilbert SF (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.

5.Majumdar NN. Vertebrate embryology; Tata McGraw-Hill, New Delhi.

6.Verma PS & Agarwal VK Chordate Embryology, S. Chand Publishers, New Delhi

7. Arora, M.P. Embryology. Himalayan Publishing House, Ramdoot, Dr. Bhalero Marg (Kelewadi) Girgaon, Mumbai – 400004.

8.Diwan,A.P.Avian Embryology, Anmol Publications Private Limited,4374/4B Ansari Road , Daryaganj, New Delhi-110 002.

9. Gilbert, Developmental Biology ,ANE Books India, Avantika Niwas, 19,Doraiswamy Road,T.Nagar,Chennai-600 017.

10, Goel,S.CP.Principles of Animal Developmental Biology,Himalaya Publishing House, NRamdoot,Dr.Bhalerao Marg (Kelewadi)Girgaon,Mumbai – 400 004.

11.Jain,P.C. Elements of Developmental Biology (Chordate Embryology).vishal Publishing Company,BooksMarket,Old Railway Road,Jalandhar – 144 008.

12.Jangir, O.P.Developmental Biology – A Manual.Agrobios (India),Behind NasraniCinema,ChopasaniRoad,Jodhpur – 342 002.

13.Nelson, E.Comparative Embryology of Vertebrates.Tata McGraw Hill Publishing Company Limited,No. 444/1 Sri EkambaraNaicker Industrial Estate, Alapakkam,Porur,
Chennai – 600 116.

14.Ramesh Mathurand Meenakshi Metha. Embryology.Anmol Publications Private Limited,4374/4B,ansari road,Daryaganj,New Delhi – 110 002.

15.Rao, K.V. Developmental Biology. A Modern Synthesis. Oxford & IBH Publishing company Private Limited, S-155 Panchshila Park, New Delhi 110017.

16.Sastry.K.V. and VineetaShukal, Developmental Biology Rastogi Publications Gangotri, Shivaji Road, Meerut-250 002.

17.Slack, Essential Developmental biology. ANE Books India. Avantika Niwas, Doraiswamy Road,T.Nager,Chennai-600 017.

18.Subramoniam, T. Developmental Biology. Narosa Publishing House Private Limited,

COs at Cognitive level and mapping with POs and PSOs

SEMESTER V PART III: CORE COURSE 5.1 – DEVELOPMENTAL ZOOLOGY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
CO1	**K-1 Remember**	3	3	3	3	2	1	1	3	3	3	3	3	3	2	1
CO2	**K-2 Understand**	3	3	3	2	2	3	3	3	3	3	3	2	3	3	3
CO3	**K-2 Understand**	3	2	3	3	3	2	2	3	3	3	2	3	2	3	2
CO4	**K-3 Apply**	3	3	3	2	3	2	1	2	3	3	1	3	3	3	1
CO5	**K-4 Analyse**	3	2	3	3	3	3	2	3	2	3	3	3	3	2	3
CO6	**K-4 Analyse**	2	3	3	2	3	3	1	3	3	3	2	2	3	1	3
CO7	**K-5 Evaluate**	3	3	2	3	2	3	2	2	3	2	3	3	2	3	1

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

Manonmaniam Sundaranar University-Tirunelveli-12

B. Sc. ZOOLOGY PROGRAMME

MODEL QUESTION

SEMESTER V

CORE COURSE 6.1–DEVELOPMENTAL ZOOLOGY

Time: 3 hours Maximum: 75 Marks

Part A (10 x1=10 marks)

Answer all questions

1. The biological union of male and female gametes is called **(CO1) K1**
   a) vitellogenesis b) **fertilization** c) parthanogenesis d) metamorphosis
2. The development of a haploid egg into an embryo is called **(CO1) K2**
   a) thelytoky b) **Arrhenotoky** c) Restitution d) Autofertilization
3. Blastoderm develops a mid dorsal thickened area called **(CO2) K1**

a) Primitive fold b) Primitive groove c) **Primitive streak** d) Primitive pit

4. In test tube baby production the hormone given to female is **(CO2) K2**
   a) **Gonodotrophin** b) FSH c) TSH d) LH
5. The brain of chick develops from **(CO3) K2**

a) neural crest b) **neural tube** c) neural fold d) neural sac

6. An embryonic tissue which organises the surrounding tissues to develop an embryo is called **(CO3) K1**
   a) differentiation b) Inductor c) **Organizer** d) Gradient
7. Thyroid hormone contains **(CO4) K1**
   a) **Iodine** b) Potassium c) Magnesium d) Iron
8. Special type of tissue connection between mother and foetus is called **(CO4) K1**
   a) diaphragm b) pericardium c) vitelline membrane d) **placenta**
9. Entire organism regenerated from a piece of tissue is **(CO5) K2**
   a) Epimorphosis b) **Morphallaxis** c) Super regeneration d) Heteromorphosis
10. Identify the IUCD used for female **(CO5) K1**
    a) **Copper T** b) Nirodh c) Mala-D d) Condom

Part B (5 x 5 -25 marks)

11. a) Elucidate the structure of sperm of a vertebrate. **OR** **(CO1) K4**
    b) Explain the events in fertillizin and antifertilizin reaction
12. a) Write short note on Fate map in Frog. **OR** **(CO2) K3**
    b) Explain the gradient theory.
13. a) Write brief account on Extra embryonic membranes in chick. **OR** **(CO3) K4**
    b) Comment on Deciduous placenta in mammals with diagram.
14. a) Describe the process of development of heart. **OR** **(CO4) K3**
    b) a) Write the different types of regeneration in Planaria with illustration.
15. a) Write short note on Amniocentesis. **OR** **(CO6) K5**
    b) Enlist the reasons and causes for the infertility in male and female.

Part C (8 x 5= 40 marks)

16. a) Explain Oogenesis in detail **OR** **(CO1) K2**
    b) Describe the major events occur in the process of prefertilization
17. a) Analyse the Cleavage patterns in animals with examples. **OR** **(CO2) K4**
    b) Evaluate and explain the process of Gastrulation in frog.
18. a) Examine the events in the development of brain in chick.**OR** **(CO3) K4**
    b) Explain the classification of placenta based on the types of tissue involved.
19. a) Give an account of Organizer **OR** **(CO4) K1**
    b) Write an essay on nuclear transplantation experiments in Acetabularia.
20. a) Consolidate the steps of test tube baby production and critically comment on its merits and demerits. **OR** **(CO7) K5**
    a) What is contraception? Explain the uses of IUCD in birth control.

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -V /Core

CORE COURSE : 5.2 MICROBIOLOGY AND IMMUNOLOGY

L	T	P	C
5	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- impart knowledge on the taxonomy, organization and infection of microbes and to develop expertise in microbial techniques.
- give awareness on the basic principles of food, industrial and environmental microbiology.
- familiarize the fundamentals of immunology, importance of immune system, lymphoid organs and key principles of immune system.
- give an insight on immune response, antigens, antibodies, immunoglobulins and how they are related to health and diseases.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO 1: understand the structure, classification and culture techniques of microbes.

CO 2: analyse and distinguish food poisoning, food spoilage and preservation methods.

CO 3: develop entrepreneurial skills with the knowledge on the role of microbes in fermentation, microbial products and the role of pathogens in human infectious diseases.

CO 4: understand the concepts of immune system, cellular and molecular basis of immune responses, autoimmunity and immunoglobulins.

CO 5: describe the different types of lymphoid organs, antigen- antibody reactions, cells of immune system and their functions.

CO 6: infuse their knowledge on histocompatibility, and immunodeficiency

to describe transplantation, vaccine and immunization techniques.

UNIT I

INTRODUCTION TO MICROBIOLOGY

Scope of Microbiology- Characters and Five kingdom classification .

Ultrastructure of bacteriophage (T4 phage), *E. coli* and fungi (Yeast).

(15L)

UNIT II

BACTERIAL CULTURE

Sterilization-Types of Culture medium –Culture of Bacteria –Bacterial growth and growth curve –factors influencing bacterial growth and maintenance. Staining of bacteria, Bio-fermenters and its role in mass culture.

(15L)

UNIT III

APPLIED MICROBIOLOGY

Role of Microbes: Preservation of Milk –Microbes in Food Spoilage. Culture of Yeast and its economic importance - Microbial Nitrogen fixation .Fermentation : Ethanol and Penicillin production. Probiotics- SCP.

Microbial diseases in man: Bacterial - Cholera & Typhoid; Viral- Rabies & HIV; Fungal - Candidiasis & Dandruff.

(15L)

UNIT IV

BASIC IMMUNOLOGY

Scope: Immunity-classification and types; Lymphoid organs- types; Cells of immune system Types of immune responses. Immunoglobulin: types and Structure of IgG. Epitopes, Paratopes, Haptens & Adjuvants. Antigen- Antibody reactions ; T- Cell and B- Cell activation; Basic properties and functions of Cytokines, Interferons and complement proteins

(15L)

UNIT V

APPLIED IMMUNOLOGY

Basic concepts of major histocompatibility complex (MHC) - Types of hypersensitivity.

Concepts of autoimmunity and immunodeficiency ;Transplantation; Monoclonal antibodies-

Vaccines & Immunization.

(15L)

(TOTAL 75L)

Books for reference

1. Dubey RC & Maheshwari DK, A Textbook of Microbiology, S. Chand Publishers, New Delhi.
2. Mani A, Selvaraj A.M, Narayanan L.M, Arumugam A, Microbiology, Saras Publication, Nagercoil.
3. Pelczar MJ, Chan EC, Pelczar MF. Elements of microbiology. McGraw-Hill International Book Company.
4. Ryan KJ, Ray CG, editors. Sherris medical microbiology. McGraw-Hill Education.
5. Willey JM, Sherwood L, Woolverton CJ. Prescott's microbiology. Singapore: McGraw-Hill.
6. Abul AbbasAndrew H. Lichtman Basic Immunology, Saunders.
7. Delves PJ, Martin SJ, Burton DR, Roitt IM. Essential immunology. John Wiley & Sons.8.Ramesh SR, Immunology, Mcgraw Higher Ed.
8. Kuby, Immunology (W.H.Freeman)

9. C.B.Powar General Microbiology

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: V **PART III: CORE COURSE: 5.2 MICROBIOLOGY AND IMMUNOLOGY**																
CO	**CONGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-2 Understand**	3	3	3	3	2	3	2	3	3	2	3	1	2	3	3
CO2	**K-4 Analyse** **K-3 Apply**	3	3	3	3	3	2	2	3	2	2	3	1	2	3	3
CO3	**K-3 Apply** **K-6 Create**	3	3	3	3	2	3	3	3	3	2	3	1	2	3	3
CO4	**K-2 Understand** **K-1 Remember**	3	3	3	3	2	2	2	3	3	2	3	1	2	3	2
CO5	**k-3 Apply** **K-5 Evaluate**	3	3	2	3	2	2	1	3	3	2	2	1	3	3	3
CO6	**K-2 Understand** **K-3 Apply**	3	3	2	3	3	2	2	3	3	2	3	3	2	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

CORE PRACTICAL: V
DEVELOPMENTAL ZOOLOGY & MICROBIOLOGY AND IMMUNOLOGY

L	T	P	C
--	--	3	2

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the student to

- know the systematic handling procedures and protocols.
- give importance to the microscopic examination of gametes and microbes.
- gain knowledge on the basic concepts and principles of techniques.
- familiarize the blood group identification and immunization.

COURSE OUT COMES (COs)

On successful completion of the practical course the student will be able to

CO1: recollect the fundamental procedure of Developmental Zoology, Microbiology & Immunology**.**

CO2: understand the principles and adopt the techniques for their future courses.

CO3: describe the structure and classification of microbes and immunoglobulisns.

CO4: apply the theoretical knowledge of food preservation, fermentation and immunization schedule.

CO5: evaluate the present situation to check any outbreak of contagious diseases.

CO6: conclude the prevalence of diseases in adverse condition and able to formulate solution to manipulate/ manage the dangerous situation.

DEVELOPMENTAL ZOOLOGY PRACTICALS

1. Mounting and Observation of live sperms of a vertebrate
2. Mounting and Observation of egg of a vertebrate
3. Temporary mounting and Observation of chick embryo development: 24, 48, 72 & 96 hours.

Museum Specimens, Slides, Models and Charts

4. Sperm of a vertebrate
5. Hen's egg/ Frog's egg
6. Blastula and Gastrula of frog
7. Chick embryo development stages – 24, 48, 72 & 96 hours
8. IUCD: Condom, Mala – D, Copper T / (any three)
9. Placenta in mammals: Discoidal, Cotyledonary, Zonary and Diffuse placenta.

MICROBIOLOGY PRACTICALS

1. Preparation of culture media for microbes and serial dilution technique.
2. Distribution of microorganisms in nature- soil, water & air.
3. Aseptic transfer of microbes & pure culture of bacteria and cultural characteristics of Micro-organisms.
4. Simple staining of bacteria
5. Gram's staining of bacteria
6. Serial dilution technique.
7. Microscopic examination of living bacteria - Hanging drop method.
8. Microscopic counting of microbes using Haemocytometer (Demonstration only)
9. Measurement of microbes using Ocular & Stage micrometers (Demonstration only)

Charts, **Slides**, **Equipments and Photos**

Autoclave, Hot air oven, Agar plate, Agar stab, Agar slant, Inoculation needle.

IMMUNOLOGY PRACTICALS

1. Identification of ABO blood grouping and Rh blood grouping among the students.
2. Lymphoid organs in Rat (Demonstration only)

Charts, Models, Slides and Photos: T- Cell, B- Cell, Stem cells, Phagocytes - Thymus,

Bone marrow, Spleen, Lymph node (T.S/ entire organ), Immunoglobulins - Ig G & Ig M.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: V **PART III: CORE PRACTICAL :V- DEVELOPMENTAL ZOOLOGY & MICROBIOLOGYAND IMMUNOLOGY**																
CO	**CONGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	2	2	2	1	2	3	3	2	2	1	2	3	2
CO2	**K-2 Understand**	3	3	3	3	3	2	2	3	2	2	2	1	2	3	3
CO3	**K-3 Apply**	3	3	3	3	2	2	3	3	3	2	3	1	2	3	3
CO4	**K-4 Analyse**	3	3	3	3	2	2	2	3	3	3	3	1	2	3	2
CO5	**K-5 Evaluate**	3	3	2	3	2	2	1	3	3	2	2	1	3	3	3
CO6	**K-6 Create**	3	3	2	3	3	2	2	3	3	2	3	3	2	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MODEL QUESTION

SEMESTER V

CORE COURSE 5.2- MICROBIOLOGY AND IMMUNOOGY

Time : 3 hours **Maximum : 75 marks**

SECTION – A (10x1=10)

Choose the Correct Answer **Mapping level**

1.Starting at the cell membrane, what is the correct order of flagellum structure **(CO1)** **K2**

a) Motor, hook, filament b) Filament, hook, motor

c) Motor, filament, hook d) Filament, motor, hook

2.Which of the following yeast can be used to produce microbial protein? **(CO1)** **K1**

a) *Eremothecium ashbyi* b) *Candida utilis*

c) *Saccharomyces cerevisiae* d) *Candida milleri*

3. Biological control used in the autoclave is the spores of **(CO2)** **K1**

a) *Bacillus stearothermophilus* b) *Clostridium perfringens*

c) *Bacillus cereus d) Clostridium tetani*

4. What is the correct order of staining reagents in Gram- staining? **(CO2)** **K3**

a) Gram's iodine, crystal violet, alcohol and safranin.

b) Crystal violet, Gram's iodine,alcohol and safranin.

c) Alcohol,crystal violet, Gram's iodine and safranin

d) Safranin crystal violet, Gram's iodine and alcohol

5.Which of the following media can serve as transport medium for

Vibrio cholera? **(CO3)** **K2**

a) Selenite F broth b) Tetrathionate broth

c) Nutrient broth d) Cary-Blair medium

6. Which of the following is symbiotic nitrogen fixing bacteria? **(CO3)** **K1**

a) *Rhizobium trifolii* b) *Pseudomonas putida*.

c) *Bacillus cereus* d) *Escherichia coli*

7. A membrane attack complex that can lyse microorganisms is produced by component of:

a) complement b) interferon alpha **(CO4)** **K1**

c) interferon beta d) antibiotics

8.Anaphylactic reactions are mediated by which class of immunoglobulin? **(CO4) K2**

a) Ig A b) Ig G c) Ig E d) Ig M

9.Grafts between members of the same species but of different genetic constitution are known as **(CO5) K1**

a) autograft b) isograft c) allograft d) xenograft

10.Fusion between a plasma cell and a tumour cells produce **(CO5) K2**

a) lymphoma b) hybridoma c) myeloma d) sarcoma

SECTION – B (5X5 = 25 Marks)

ANSWER ALL QUESTIONS CHOOSING EITHER (a) OR (b)

11.a) Discuss the scope of Microbiology. (Or) **(CO1) K3**

b) Describe the ultrastructure of yeast.

12.a) Define the term: Sterilization, Disinfection and Antiseptics. Write in detail on various agents used in sterilization. **(CO2) K3**

b) What are the various types of staining techniques in Microbiology

13 a) What are the role of Microbes in food spoilage with an example each.
(Or) **(CO3) K4**

b) Write *aetiology* of *candidiasis*. What are the key symptoms of candidiasis?

14 a)Discuss the types and functions of lymphoid organs. (Or) **(CO4) K3**

b) Write the basic properties and function of interferon.

15 a) Define hypersensitivity. Explain type I hypersensitivity .(Or) **(CO5) K4**

b) Write short note on transplantation immunology .

SECTION – C (5X8 = 40 marks)

ANSWER ALL QUESTIONS CHOOSING EITHER (a) OR (b)

. 16.a)Write the ultra structure of T_4 bacteriophage. (Or) **(CO1) K3**

b) Give an account on five kingdom classification.

17. a) Define: Culture medium. Discuss different types of bacterial culture medium.
(Or) **(CO2) K4**

. b) Write the factors influencing bacterial growth.

18 a) Define fermentation. How penicillin is produced by fermentation?. **(CO3) K4**
(Or)

b)Write an essay on bacterial diseases of man and its control measure.

19 a) Explain in detail about immunoglobulin structure and types. (Or) **(CO4) K4**

b) Write an essay on classification and types of immunity .

20 a) Discuss in detail about the production of monoclonal antibody (Or) **(CO5) K5**

b) Define Vaccination. Write the immunization schedule .

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -V /Core
CORE COURSE: 5.3 – ANIMAL PHYSIOLOGY

Credits: 4

L	T	P	C
5	--	--	4

LEARNING OBJECTIVES (LOs)
The objectives of the course are enabling the student to

- find the basic understanding of the fundamental process and mechanism of the higher animals,
- understand the modifications and disorders o humans.
- develop knowledge about the functions of organs and tissues in different animals.
- elucidate the biological functions and how they adapt under various environmental conditions.
- analyse the animals' behaviour and their physiological response to their environment

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: list out the physiological concepts in nutrition, digestion, metabolism, respiration etc.,

CO2: compare the various physiological processes in the animals.

CO3: identify the working mechanisms of effectors, homoeostasis and understand how the animals adapt in the environments.

CO4: analyse the fundamental interactions between physiology and endocrinology.

CO5: justify the correlation of structure, coordination of functions and working system in the organs in the human body.

CO6: determine and understand the various physiological disorders due to the imbalance of hormones, chemicals and metabolism.

CO7: develop thorough knowledge about the structure and function of the organisms and execute the ideas in research projects.

UNIT I

NUTRITION & RESPIRATION

Nutrition: Gastrointestinal tract of man. Digestion - role of enzymes and absorption of carbohydrates, proteins and lipids. Minerals & Vitamins – their deficiency.

Respiration: Structure of lungs in man. Respiratory pigments: structure of haemoglobin, Transportation and exchange oxygen and carbon dioxide – Bohr's effect - bronchitis, asthma - Physiological effects of smoking.

(15L)

UNIT II

CIRCULATION & EXCRETION

Blood- composition and functions, Mechanism of clotting. Structure of heart – Heart beat & Pace maker – Cardiac cycle – ECG – Pulse rate and Blood Pressure- Heart diseases.

Kinds of excretory products & Patterns of excretion in animals- Structure of kidney - Nephron - mechanism of urine formation - composition of urine – Nephritis- Dialysis.

(15L)

UNIT III

MUSCLE & NERVE PHYSIOLOGY

Types of muscles, Ultrastructure of striated muscle - Muscle contraction & properties. Simple muscle twitch- Tetanus – Muscle fatigue.

Neurons – structure & types - Impulse propagation, synaptic transmission, neurotransmitters - Reflex action, Nerve disorders – epilepsy, Alzheimer's disease, Parkinson's disease.

(15L)

UNIT IV

SENSE ORGANS

Eye: structure, physiology of vision, visual elements and pigments. Eye defects- myopia, hyperopia, presbyopia, astigmatism, cataract, glaucoma.

Ear: Structure and mechanism of hearing - Hearing impairments – deafness, labyrinthine disease.

Olfactory, gustatory and tactile and mechanical sense organs.

(15L)

UNIT V

ENDOCRINE GLANDS & REPRODUCTIVE PHYSIOLOGY

Endocrine glands and Hormones: Structure, their action and disorders- Pituitary, Thyroid, Parathyroid, Adrenal, Islets of Langerhans, Testis & Ovary.

Reproductive Physiology : Testis and Ovary- Graafian follicles- menstrual cycle- puberty, adolescence, pregnancy, parturition, lactation, menopause. Oestrous cycle in cattle.

(15L)

(TOTAL 75L)

Books for reference

1. Arumugam N&.Mariakuttikan A Animal Physiology Saras Publications, Nagercoil.

2. Bhagavan NV, Medical biochemistry, fourth edition
Academic Press

3. Guyton AC, Hall JE, Text Book of Medical Physiology, Elsevier4.Jain AK Textbook of Physiology. Avichal Publishing Company.

5. Lehninger AL, Michael Cox, Nelson DL, Biochemistry. Macmillan.

6. Tyagi BS, Agarwal VK & Verma PS Animal Physiology S. Chand Publishers,New Delhi.

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8. Juneja, Kavita, Animal physiology. Anmol Publications Pvt. Ltd, 4374/4B AnsariRoad, Daryaganj. New Delhi

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13.William, S. Hoar, General and Comparative Physiology. Prentice – Hall of India,M-97 Connaught Circus, NewDelhi.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER V PART III : CORE COURSE: 5.3 - ANIMAL PHYSIOLOGY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
CO1	**K1- Remember**	3	3	3	3	2	1	1	3	3	3	3	3	3	2	1
CO2	**K2- Understand**	3	3	3	2	2	3	3	3	3	3	3	2	3	3	3
CO3	**K3- Apply**	3	3	3	3	3	2	2	3	3	3	2	3	2	3	2
CO4	**K4- Analyse**	3	3	3	2	3	2	1	2	3	3	1	3	3	3	1
CO5	**K5- Evaluate**	3	2	3	3	3	3	2	3	2	3	3	3	3	2	3
CO6	**K5- Evaluate**	3	3	3	3	3	3	2	3	3	3	2	2	3	1	3
CO7	**K6- Creativity**	3	3	2	3	2	3	2	2	3	2	3	3	2	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -V /Core Practical

CORE PRACTICAL : VI- ANIMAL PHYSIOLOGY

L	T	P	C
3	--	--	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the student to

- know the principle of the rate of oxygen consumption of a fish.
- understand the physiological function by experiments.

- attain a level of understanding to handle practicals.
- gain knowledge on basic physiological functions.

COURSE OUTCOMES (COs)

On successful completion of the practical course the student will be able to

CO1: find and calculate the rate of oxygen consumption of a fish by Winkler's method.

CO2: analyse the effect of temperature on physiological activity.

CO3: verify the basic principles and appl it to solve the problem.

CO4: compare the results and confirm the qualitative tests.

CO5: design an experiment to prove the physiological principles and concepts.

PRACTICALS

1. Rate of Oxygen consumption in a fish.
2. Effect of temperature on the Opercular movement of a fish – Calculation of Q_{10}.
3. Action of Salivary amylase in relation to enzyme concentration.
4. Qualitative test for carbohydrate (glucose), protein and lipid.
5. Demonstration of blood pressure using Sphygmomanometer.
6. Estimation of Haemoglobin – demonstration only.
7. Counting of different kinds of blood cells using Haemocytometer – demonstration only.
8. Qualitative test for Ammonia, Urea and Uric acid.

Slides, Models and Charts – Glucose, Fructose, Glycogen, Amino acid, Cholesterol, Intestinal villi, Haemoglobin, Myoglobin, ECG, Sphygmomanometer, Haemometer, Haemocytometer, Kymograph, Cardiac muscle, Striated muscle and Non – Striated muscle, Simple muscle twitch. Testis, Ovary- T.S

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: V PART III: CORE COURSE PRACTICAL: VI – ANIMAL PHYSIOLOGY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-2 Understand K-3 Analyse**	2	2	1	2	2	3	2	3	3	3	2	3	3	1	3
CO2	**K-3 Analyse K-5 Evaluate**	2	3	2	3	2	2	3	3	2	3	2	2	2	1	2
CO3	**K-4 Apply**	2	3	2	3	2	3	3	2	3	3	2	2	2	3	3
CO4	**K-5 Evaluate**	3	3	1	3	2	3	3	2	3	3	3	2	2	3	3
CO5	**K-6 Create**	2	3	3	3	2	2	2	3	3	2	3	2	3	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MODEL QUESTION
SEMESTER V

CORE COURSE 5.3- ANIMAL PHYSIOLOGY

Time: 3 hrs **Maximum : 75Marks**

PART – A

Answer ALL questions (10 x 1 = 10)

Choose the correct answer **Mapping level**

1. Ascorbic acid is **(CO1) K1**

(a) **Vitamin C** (b) Vitamin B (c) Vitamin D (d) Vitamin E

2. Fats are absorbed by **(CO1) K2**

(a) colon (b) **lacteals** (c) gastric juice (d) duodenum

3. The chief nitrogenous waste in mammals **(CO2) K1**

(a) **Urea** (b) Ammonia (c) Uric acid (d) All the above

4. Purkinje fibre is present in **(CO2) K1**

(a) Brain (b) **Heart** (c) Eye (d) Ear

5. The basic unit of nervous system **(CO3) K1**

(a) Muscle (b) Nephron (c) **Neuron** (d) Axon

6. Muscle fatigue occurs due to the accumulation of **(CO3) K2**

(a) Amino acid (b) **Lactic acid** (c) Uric acid (d) Carbondioxide

7. Glaucoma is **(CO4) K2**

(a) pressure in blood vessels (b) **pressure in eye** (c) pressure in heart (d) pressure in lungs

8. Organ of Corti is present in **(CO4) K1**

(a) middle ear (b) **inner** ear (c) tympanum (d) ear drum

9. Beta cells are present in **(CO5) K1**

(a) Thyroid (b) Adrenal (c) Parathyroid (d) **Islets of Langerhans**

10. Goitre is caused due to the deficiency of **(CO5) K2**

(a) **Iodine** (b) ATP (c) Globulin (d) None

PART – B (5 x 5 = 25 Marks)

Answer ALL questions choosing either a or b

11. (a) Give the role of enzymes in carbohydrate digestion? **(OR) (CO1) K3**

(b) Explain the role of Haemoglobin in Oxygen transport.

12. (a) Comment on ECG and its

diagnostic applications **(OR) (CO2) K4**

(b) Classify the patterns of excretion in animals.

13. (a)) Explain the properties of muscles. **(OR) (CO3) K3**

(b). Write the physiology of Synapse.

14. (a) Enlist the defects in vision **(OR) (CO4) K4**

(b) Explain the diverse types of gustatory sense organs .

15. (a) Discuss the structure and functions of Islets of Langerhans **(OR) (CO5) K5**

(b) Explain the structure of Pituitary gland with neat sketch.

PART – C (8 x 5 = 40 Marks)

Answer ALL questions choosing either (a) or (b)

16. (a) Describe the absorption of digested food in small intestine **(OR) (CO1) K3**

(b).Write in detail about the Co2 transport in mammals.

17. (a) Elucidate the conduction of heart beat in man **(OR) (CO2) K5**

(b) Explain the mechanism of urine formation

18. (a)) Explain the mechanism of muscle contraction **(OR) (CO3) K4**

(b).Write an essay on conduction of nerve impulses.

19. (a) Elaborate the structure of human eye and vision **(OR) (CO4) K5**

(b).Write in detail about the mechanoreceptors with reference to human ear

20. (a) Explain the structure and physiological role of Adrenal glands **(OR) (CO5) K4**

(b) Give an account on the role of hormones in menstrual cycle.

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -V /Core

CORE COURSE: 5.4 - ECOLOGY

L	T	P	C
5	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- know the fundamental concepts and facts about the environment and the interaction of its various components.
- study the recycling of nutrients in lieu with biogeochemical cycles
- understand about various types of ecosystems.
- make an awareness about various effects of pollution and its management
- elucidate the importance of biodiversity and need for its conservation.

COURSE OUTCOMES (COs)

On the successful completion of the course the student will be able to

CO1: recall the principles, applications and concepts of ecology and ecosystem, how biotic and abiotic factors that are related to ecosystem.

CO2: understand how the animals interact with each other and their natural environment.

CO3: analyse and compare the differences in the structure and function of different types of ecosystem.

CO4: emphasize the role of key factors responsible for changes in natural ecosystem such as pollution and urbanization and capable of pollution and other effects.

CO5: interpret the diversity of species in relation to natural process and sustenance of life.

CO6: apply the acquired knowledge in ecology to solve and manage the

current environmental issues and problems.

UNIT I

ECOLOGICAL CONCEPTS

Ecosystem: concept, structure & function. Abiotic factors and its ecological role: Soil, Light, Temperature, Water- Limiting factors.

Food chain & Food web, Pyramids - Trophic levels- Energy flow.

Population Ecology – Community Ecology.

(15L)

UNIT II

NUTRIENT CYCLES & INTERACTIONS

Biogeochemical cycles: Carbon, Sulphur, Nitrogen and Phosphorous. Animal relationships: Mutualism, Commensalism, Parasitism, Competition and Predation.

(15L)

UNIT III

HABITAT ECOLOGY

Ecosystem: characteristic features and types: Freshwater - Lotic & Lentic, Marine, estuarine, mangrove, tundra, Savanna, cave, forest and desert ecosystems. Ecotone & edge effect. Ecological succession, Significance & Conservation of wetlands, Ecological effects of dams, hydroelectric projects.

(15L)

UNIT IV

POLLUTION

Types, causes, effects & management of Land, Water, Air, Thermal, Noise & Pesticide pollution. Nuclear Hazards –Management of Solid waste, Plastic waste, Medical waste and e-waste.

(15L)

UNIT V

CONSERVATION

Biodiversity– definition, loss & cause. IUCN, CITES - Brief out lines of Indian laws of conservation. Biodiversity hot spots in India. Indian Endangered species & conservation, Community reserves, Sanctuaries, National Parks and Tiger Reserves in Tamil Nadu. Afforestation & Deforestation. Human and animal conflicts.

(15L)

(Total 75L)

Books for reference

1. Arumugam N Concepts of Ecology, Saras Publication, Nagercoil.

2. Gupta PK, Cytology, Genetics & Evolution, Rastogi Publications, Meerut.

3.Verma PS,& Agarwal VK, Environmental Biology: Principles of Ecology, S Chand Publishers, New Delhi.

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7. Arumugam N Organic Evolution, Saras Publication, Nagercoil.

8. Caughley G, Sinclair AR. Wildlife ecology and management. Blackwell Science.

9. Divan S, Rosencranz A. Environmental law and policy in India: Cases, materials and statutes. New Delhi: Oxford University Press. Arora, M.P. Ecology. Himalaya Publishing House, Ramdoot, Dr.Bhalerao Marg, Girgaon, Mumbai- 400 004.

10. Clarke, G.L. Elements of Ecology, John Wiley & sons Inc. New York.

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Porur, Chennai – 600 116.

13. Purohit, S.S. A Text book of Environmental Science, Student Edition, Agrobios (India), Behind Nasrani Cinema, Chopasani Road, Jodhpur – 342 002.

14. Singh, H.R. and Neeraj Kumar. Ecology and Environmental Science, Vishal Publishing Company, Books Market, Old Railway Road, Jalandhar – 140 008.

15. Singh, S.P.Animal Ecology, 6th Edition, Rastogi Publications, Gangotri, Shivaji Road, Meerut – 250 002.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: V PART III: CORE COURSE : 5.4. ECOLOGY															
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	1	3	1	2	1	3	3	3	2	2	3	3	2
CO2	**K-2 Understand**	2	3	2	3	1	1	1	3	1	2	2	2	3	2	2
CO3	**K-3 Apply**	2	3	1	3	3	2	2	3	3	3	2	2	3	3	2
CO4	**K-4 Analyse**	2	2	2	2	1	2	2	3	1	3	3	2	3	2	2
CO5	**K-5 Evaluate**	-	2	1	1	2	2	1	3	1	3	3	2	2	2	2
CO6	**K-6 Create**	-	-	-	1	2	2	2	3	3	2	2	2	3	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

SEMESTER V

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -V /Core Practical

CORE PRACTICAL VII- ECOLOGY

L	T	P	C
--	--	3	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the student to

- determine the physicochemical parameters of the water samples.
- identify the planktons in the aquatic habitat.
- know the examples for animal associations and its ecological importance.
- illustrate the ecological adaptations with examples.

COURSE OUTCOMES (COs)

On successful completion of the practical course the student will be able to

CO1: compare and interpret the results of estimated the physicochemical parameters of the water samples.

CO2: analyze and understand the planktonic adaptations.

CO3: develop the skill to explain the ecological adaptations with specific examples.

CO4: create awareness to conserve the natural habitat

PRACTICALS

2. Estimation of pH – ant 2 water samples
3. Estimation of total solids- any 2 water samples
4. Estimation of turbidity using Secchi disc.
5. Estimation of dissolved oxygen – any 2 water samples
6. Estimation of carbon dioxide – any 2 water samples
7. Estimation of total and phenolphthalein alkalinity- any 2 water samples
8. Identification of any two zooplanktons either fresh water or marine,
9. Visit to Sanctuaries and National Parks- Report (Mandatory)

Museum specimens, slides, models and charts

Mutualism :Hermit crab and Sea anemone; Commensalism: Echeneis and Shark;

Parasitism: Sacculina on Crab; Predation: Snake and Rat. Effect of temperature:

Cyclomolphosis- Daphnia; Effect of light: Protective Colouration - Leaf insect and

Colour changes - Chamaeleon.

Charts: Ecosystem- Pond; Food Chain –.Forest Ecosystem-; Food Web – Grass land.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: V CORE COURSE PRACTICAL: VII – ECOLOGY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-4 Analyse**	2	2	1	-	2	3	2	3	3	3	2	-	-	2	-
CO2	**K-2 Understand**	2	1	2	-	2	2	3	3	2	3	2	2	2	3	2
CO3	**K-5 Evaluate**	2	2	2	2	2	3	3	2	3	3	2	2	2	3	3
CO4	**K-6 Create**	-	2	1	-	2	3	3	2	3	3	3	2	2	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

B.Sc., ZOOLOGY

MODEL QUESTION

CORE COURSE: 5.4 – ECOLOGY

Time: 3 Hrs **Maximum Marks:75**

PART A (10 X 1 =10 marks)

Answer All Questions **Mapping level**

1. Which of the following is the basic unit of ecology? **(CO1)** **K1**
   A) Population B) Environment C) Biosphere D) **Ecosystem**
2. Different food chains are interconnected in the form of a network-like structure is called **(CO1)** **K2**
   A) **Food web** B) Food chain C) Trophic level D) Niche
3. Cycling of nutrients between abiotic and biotic environments is called **(CO2)** **K2**
   A) Energy flow B) **Biogeochemical cycles** C) Food chain D) Trophic level
4. A mutual relationship between two organisms is called **(CO2)** **K1**
   A) Symbiosis B) **Mutualism** C) Parasitism D) Food chain
5. Which one of the following is not a characteristic feature of the desert ecosystem?
   A)Heavy rainfall B) Drought C) Humidity D) Heavy wind velocity **(CO3)** **K2**
6. The process of change in the species structure of an ecological community over time.
   A) Biosphere B) Mutualism C) **Ecological succession** D) Ecotone **(CO3)** **K2**
7. Introduction of harmful materials into the environment **(CO4)** **K2**
   A) **Pollution** B) Biomagnification C) Global warming D) Toxicity
8. Best method of disposing of medical waste is **(CO4)** **K2**
   A) Heating B) Composting C) **Incineration** D) Sanitary landfills
9. The variety of plant and animal life in the world is called **(CO5)** **K1**
   A) Food chain B) Symbiosis C) Ecosystem D) **Biodiversity**
10. A place where killing and poaching of animals is prevented **(CO5)** **K2**

A) **Sanctuary** B) Biosphere C) National park D) Desertification

PART – B (5 X 5 = 25 marks)

Answer All Questions choosing either (a) or (b)

11. a) Explain the structure and functions of the ecosystem

(OR) **(CO1) K3**

11. b) Describe the types of pyramids

12.a) With a neat sketch explain the nitrogen cycle.

(OR) **(CO2) K4**

12.b) Compare and contrast mutualism from commensalism

13.a) "Pond is a typical ecosystem"- Prove

(OR) **(CO3) K5**

13.b) List down the ecological effects of dams

14. a) Write down the sources of air pollution

(OR) **(CO4) K4**

14. b) Describe the methods of disposing solid waste

15.a) Write down the causes of loss of biodiversity in India and suggest remedies

(OR) **(CO5) K6**

15.b) Describe the methods adopted for preventing deforestation

PART –C (5 X 8= 40 marks)

Answer ALL Questions choosing either (a) or (b)

16.a) Temperature affects the organisms of the environment -Justify

(OR) **(CO1) K5**

16.b) Write down the characteristics of a population

17.a) With neat diagram explain carbon and sulphur cycles

(OR) **(CO2) K4**

17.b) Describe the types of parasitism among animals with examples

18.a) Explain the characteristic features of cave and desert ecosystems

(OR) **(CO3) K3**

18.b) Describe the types of ecological succession

19.a) Write down the sources and control measures of water pollution

(OR) **(CO4) K5**

19.b) Discuss the sources of noise pollution and their biological effects.

20.a) Briefly explain the biodiversity hotspots of India

(OR) **(CO5) K4**

20.b) Write an essay on Sanctuaries and National parks in India

****

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI/Core

CORE COURSE : 6.1 - EVOLUTION

L	T	P	C
5	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- know the origin of life with various evidences.
- study various theories of Evolution.
- elucidate the various concepts in relation to evolution
- classify mimicry, protective colouration and adaptations in relation to evolution
- portray the different phases of evolution of horse, human beings and patterns of animal distribution.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to
CO1: understand the origin of life and evidences in favour of evolution
CO2: accept the modern concept of evolution
CO3: analyse the concept of evolution especially population geneties.
CO4: learn relationship between abiotic and biotic factors adaptation in the view of evolution
CO5: get thorough knowledge of the tree diagram of evolution of various animals and patterns of distribution

UNIT I

EVIDENCES OF EVOLUTION

Origin of life: Abiogenesis, Biogenesis, Cosmic theory, Biochemical origin of life, Urey-Miller experiment. Evidences of evolution: Morphological & Anatomical, Embryological, Physiological & Biochemical and Paleontological evidences.

(15L)

UNIT II

THEORIES OF ORGANIC EVOLUTION

Lamarckism, Neo Lamarckism, Darwinism, Neo Darwinism, Mutation theory & New version of mutation theory. Modern Synthetic theory of evolution. Natural Selection. Convergent & Divergent evolution.

(15L)

UNIT III

ADAPTATION & ISOLATION

Adaptation– Colouration and Mimicry -types and significance –Non- adaptive traits –Neotony & Significance. Isolation- Mechanism & Species concept -Speciation and Variation. Hardy - Weinberg Equilibrium - Genetic drift. Basic outlines of Molecular evolution.

(15L)

UNIT IV

ANIMAL DISTRIBUTION

Zoogeographical regions – Palaearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions -their Climatic and faunal peculiarities. Wallace line- Discontinuous distribution - Continental Drift - Geological time scale (Up to periods for Paleozoic & Mesozoic era; Up to epoch for Cenozoic era).

(15L)

UNIT V

EVOLUTION OF HIGHER FORMS

Evolutionary significance of Dipnoi– Origin of Amphibia – Golden age of Reptiles -Major types of Dinosaurs and reason for extinction, Affinities of Archaeopteryx, Outlines of evolution of Man.

(15L)

(Total 75L)

Books for references

1.Verma PS & Agarwal VK Cell Biology, Genetics, Evolution and Ecology, S Chand Publishers, New Delhi.

2. Gupta PK, Cytology, Genetics & Evolution, Rastogi Publications, Meerut.

3. Arumugam N Organic Evolution, Saras Publication, Nagercoil.

4. Barton NH, Briggs DEG, Eisen JA, Goldstein DB and Patel NH, Evolution. Cold Spring, Harbour Laboratory Press.

5. Hall BK &Hallgrimsson B, Evolution, Jones and Bartlett Publishers.

6. M.P. Arora Evolution

7. Moody, Introduction To Evolution.

8. Dobzhansky, Th.: Genetics And The Origin Of Species 1951,Columbia Uty. Press.

9. Dodson, Evolution – Process and Product.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI PART III- CORE COURSE : 6.1 EVOLUTION																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-2 Understand**	3	3	3	2	2	2	2	3	3	3	3	2	2	1	0
CO2	**K-3 Apply**	3	3	3	2	2	1	1	3	3	3	2	2	2	1	0
CO3	**K-4 Analyse**	3	3	2	2	3	2	1	3	3	2	3	2	2	2	1
CO4	**K-5 Evaluate**	3	2	2	3	2	2	2	3	3	2	3	2	2	2	1
CO5	**K-6 Create**	3	2	2	2	2	2	1	3	2	2	1	1	2	1	o

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1);

No Correlation (0)

MANONMANIAM SUNDARANAR UNIVERSITY,TIRUNELVELI-12

MODEL QUESTION PAPER

For those who joined in 2021 onwards.

SEMESTER-VI

Time: 3 hrs **CORE COURSE -6.1 EVOLUTION** **Maximum: 75 marks**

PART-A (10x1=10 marks) **Mapping level**

Choose the correct answer

1. The founder of Biogenesis **(CO1)** **K1**

(a) F.Redi (b) Richter (c) Preyer (d) Cuvier

2. Evidences considered as written documents for Evolution **(CO1)** **K2**

(a) Morphology & Comparative Anatomy (b) Geological Scale

(c) Physiology (d) Palaeontology.

3. Postulates of Lamarck are presented in the book of **(CO2)** **K1**

(a) Philosophique Zoology (b) Origin of Species

(c) Rate of Evolution (d) Effects of Mutation.

4. Mutation theory was first formulated by **(CO2) K1**

(a) Muller (b) Dobzhansky

(c) Hugo De Vries (d) Mendel

5. The leaf insect Phylium is an example for **(CO3) K1**

(a) Protective mimicry (b) Warning mimicry

(c) Aggressive mimicry (d) Polymorphism

6. Factors that upset Hardy-Weinberg equilibrium. **(CO3) K2**

(a) Mutation (b) Natural Selection (c) Genetic drift (d) All.

7. Area which covers South America, Central America, West Indies and Southern Mexico **(CO4) K1**

(a) Palaearctic (b) Nearctic (c) Neotropical (d) Ethiopian

8. The first and oldest of the geological time scale is **(CO4) K1**

(a) Coenozoic era (b) Archaeozoic era (c) Proterozoic era (d) Mesozoic era

9. Golden age of Reptiles **(CO5) K1**

(a) Palaeozoic era (b) Mesozoic era (c) Coenozoic era (d) Proterozoic era.

10. Man belongs to the order **(CO5) K2**

(a) Primates (b) Chiroptera (c) Rodentia (d) Carnivores

PART-B (5X5=25 marks)

Answer ALL questions choosing either (a) or (b) about 250 words

12. (a) Compare and contrast homologous and analogous organs with example. (or) **(CO1) K4**

(b) Briefly explain Urey and Miller's experiment in relation to the origin of life.

12. (a) Explain Neo-Lamarckism with any three experimental evidences. (or) **(CO2) K3**

(b) Enlist and explain the special features of Mutation theory.

13. (a) Differentiate Batesian and Mullerian mimicry with examples. (or) **(CO3) K4**

(b) State Hardy-Weinberg equilibrium and comment on the factors affect the equilibrium

14. (a) What are the factors affecting discontinuous distribution ? (or) **(CO4) K3**

(b) Explain the range, physical factor and fauna of oriental region

15. (a) Explain the evolutionary significance of Dipnoi. (or) **(CO5) K4**

(b) Describe the origin of amphibian.

PART-C (5x8=40 marks)

Answer ALL questions choosing either (a) or (b) about 600 words.

16. (a) Deduce the embryological evidences in favour of organic evolution. (or) **(CO1) K3**

(b) Explain the biochemical and physiological evidences in support of organic evolution

17. (a) State Darwinian Principles and explain in detail about Darwinian . **(CO2) K4**

Syllogism.(or)

(b) Explain the modern synthetic theory of evolution.

18. (a) Give an account on Neoteny and its evolutionary significance. (or) **(CO3) K5**

(b) "Variation is the raw material for evolution"-Discuss

19. (a) Write about the reasons for discontinuous distribution and give examples. (or)

(CO4) K4

(b) Critically comment on the following with reference to range, physical factor and fauna .

(i) Palaearctic

(ii) Nearctic

20. (a) Explain the affinities of Archaeopteryx. (or) **(CO5) K4**

(b) Write an essay on cultural evolution of man.

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core

CORE COURSE: 6.2- ANIMAL BIOTECHNOLOGY

L	T	P	C
5	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- learn the fundamentals of modern Molecular techniques.
- understand the mechanism of Gene Expression and Regulation.

- give a nut shell idea of various protocols followed in Biotechnology in relation to animal science.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: relate the basic principles of recombinant DNA technology

CO2: explain various molecular techniques used in modern biotechnology.

CO3: categorise the cell and organ culture techniques.

CO4: make use of hybridoma technology for the production of monoclonal antibody.

CO5: compare the microbial enzyme and artificial enzymes

CO6: explain the general principles of generating genetically modified organisms and modern artificial methods in biotechnology.

UNIT I

RECOMBINANT DNA TECHNOLOGY

Scope of Biotechnology. Restriction Endonucleases. Modifying Enzymes (Reverse transcriptase, SI Nuclease, Tag DNA Polymerase, DNA Ligase). **Cloning Vectors:** pBR322, Lambda Phage & SV40. *Gene Cloning*: **Integration of Desired Gene into the Vector. Introduction of Recombinant DNA into Host cells**- Transformation, Transfection, Microinjection, Electroporation. **Screening and Selection of Recombinants** - Direct selection, Insertional inactivation, Blue-White selection, Colony Hybridization**.**

(15L)

UNIT II

MOLECULAR TECHNIQUES

Blotting techniques -Southern, Northern and Western. **Methods to isolate DNA** – PCR Types, Principle & Applications. **Electrophoresis** – Types and Principle. **DNA probes & diagnosis. Molecular Markers-** RAPD – FISH- RFLP. **DNA Library. DNA finger printing and its applications.**

(15L)

UNIT III

ANIMAL CELL AND TISSUE CULTURE

Primary culture - Applications. **Steps involved in mammalian cell culture**. *He la &WI38* cell lines – Maintenance of cell lines. **Hybridoma Technology** - Monoclonal antibody Production. **Organ culture -** Techniques and Application. **Animal cloning** – Dolly.

(15L)

UNIT IV

ENZYME BIOTECHNOLOGY

Microbial production- application of enzymes. **Ribozymes. Artificial enzymes. Immobilization of enzymes** - methods and its application. **Biosensors. Commercial production of Insulin. Cryobiology** – Methods of Cryopreservation.

(15L)

UNIT V

APPLICATIONS

Genetically modified Animals -Transgenic Animals (Fish, Mice, Sheep & Cow) & its significance. Applications of **r-DNA technology. Human Genome Project. Microarray, Biochips, Gene therapy, Super bug & bioremediation, Biofuels. Bioweapons, Solid and Liquid waste management. Biogas production. Biopesticides.**

(15L)

(TOTAL: 75L)

Books for reference

1. Brown TA. Gene cloning. London: Chapman & Hall; 1995.
2. Primrose SB, Twyman R. Principles of gene manipulation and genomics. John Wiley & Sons; 2013 May 28.
3. Robertis D. Cell and Molecular Biology. Lea &Febiger,U.S
4. Verma P.S & Agarwal V.K Genetic Engineering,S. Chand Publishers, New Delhi.
5. Prof.V. Kumaresan,"Animal Biotechnology", Saras Publication, A.R.P. Camp Road, Periavilai, Kottar P.O.,Nagercoil, K.K.Dist., - 629002.
6. Kumar H.D. A text book of Biotechnology, Affiliated East – West Press Ltd., NewDelhi
7. Animal Biotechnology,2006,R.Sasidhara, MJP Publishers, Chennai.
8. Dubey R.C "A text book of Biotechnology" S.Chand & Co., Ltd., NewDelhi.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER VI PART III- CORE COURSE: 6.2- ANIMAL BIOTECHNOLOGY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-2 Understand**	3	3	3	3	2	2	0	3	1	2	1	3	3	3	3
CO2	**K-2 Understand**	3	3	2	3	1	1	1	3	1	1	1	2	3	2	3
CO3	**K-4 Analyse**	3	3	3	3	3	2	2	3	1	2	1	3	3	2	3
CO4	**K-3 Apply**	3	3	3	3	2	1	1	3	1	2	1	2	3	3	2
CO5	**K-5 Evaluate**	3	3	3	3	1	1	1	3	1	1	1	2	3	2	2
CO6	**K-2 Understand**	3	3	3	3	3	3	2	3	1	2	1	3	3	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1) No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Practical

CORE PRACTICALVIII- EVOLUTION & ANIMAL BIOTECHNOLOGY

L	T	P	C
--	--	2	2

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the student to

- understand the gene frequency distribution in a population.
- elucidate the application of probability in genetics experiments.
- know the evolutionary importance and biotechnological applications of given models and specimens.
- understand the basic techniques of biotechnology from demonstrations

COURSE OUTCOMES (COs)

On successful completion of the practical course the student will be able to

CO1: evaluate the gene frequency in the light of Hardy- Weinberg law and Probability.

CO2: apply the known basic techniques for their projects and future studies.

CO3: relate the evolutionary significances of the known organisms.

CO4: understand and apply the biotechnological techniques for their higher studies.

CO5: describe and evaluate the significance of the tools in biotechnology.

CO6: develop a model prescribing the applications of biotechnology in day to day life.

PRACTICALS

EVOLUTION

1. Gene Frequency : Hardy -Weinberg law- Probability Experiment.

2. Museum Specimens, **Slides**, **Models and Charts:**

Animals of evolutionary significance: Peripatus, Archaeopteryx, Limulus.
Colouration and Mimicry: Lycodon and Krait; Stick insect, Leaf insect.
Mutation: Peppered Moth, Ancon Sheep.
Variations : Variation in finger prints.

ANIMAL BIOTECHNOLOGY

1. Isolation of genomic DNA –Demonstration.
2. Isolation of Plasmid –Demonstration
3. Protoplast preparation and fusion –Demonstration
4. Estimation of Co_2 in any three- effluent / sewage water samples –(Individual)
5. Isolation of Protein by PAGE –Demonstration.
6. **Models / Charts / Photos:**

PBR 322, Ti plasmid, Lambda Phage, SV40, Restriction enzyme, recombinant DNA, Gene cloning, Electroporation, Microinjection, Southern blotting, RFLP, RAPD, Monoclonal antibody, Stem cells, Dolly- Transgenesis, Organ culture, Anaerobic Digester, Fermentor.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI PART III: CORE PRACTICAL COURSE : PRACTICAL VIII EVOLUTION AND ANIMAL BIOTECHNOLOGY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	2	1	2	2	-	-	-	3	2	2	2	2	1	2	1
CO2	**K-2 Understand**	3	3	2	3	-	2	-	3	2	3	2	3	1	2	3
CO3	**K-3 Apply**	3	3	2	3	1	2	2	3	3	3	2	3	2	3	3
CO4	**K-4 Analyse**	3	3	3	3	2	3	2	3	3	3	2	3	2	3	3
CO5	**K-5 Evaluate**	3	3	3	3	2	-	2	3	2	3	3	3	2	3	3
CO6	**K-6 Create**	3	2	3	3	2	-	2	3	2	3	3	3	2	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

B.Sc (CBCS) DEGREE EXAMINATION

Sixth Semester

Model question Paper

ZOOLOGY

CORE COURSE 6.2- ANIMAL BIOTECHOLOGY

(For those who joined in 2021-2022)

Time: 3hr Maximum: 75marks

PART -A (10 X 1 = 10 Marks)

Choose the correct answer Mapping level

1. Reverse transcriptase enzyme is isolated from **(CO1) K2**
   (a) TMV (b) Rous sarcoma virus
   (c) Simian virus (d) Adeno virus
2. 'Tra' genes are present in **(CO1) K1**
   (a) col- plasmid (b) R- Plasmid
   (c) E- Plasmid (d) Degradative plasmid
3. ---------- technique is used to separate DNA fragments **(CO2) K2**
   (a) Southern blotting (b) Northern blotting
   (c) Western blotting (d) All of these
4. The molecular marker RAPD was developed by **(CO2) K1**
   (a) J.G.K. Williams (b) H. Gobind
   (c) E. Southern (d) Y.B.D. Skermman
5. The culture flask is incubated at the temperature of **(CO3) K1**
   (a) 27 ℃ (b) 37℃
   (c) 30 ℃ (d) 42℃
6. Which one of the following natural product is present in the tissue culture media ?
   (a) Blood platelets (b) Blood corpuscles **(CO3) K2**
   (c) Blood plasma (d) Blood pigments
7. Small membrane capsules contain enzyme are called **(CO4) K1**
   (a) Microcapsules (b) Enzyme entrapment
   (c) Carriers (d) All of these
8. Long – time storage of animal cells at super – freeze temperature is called --------
   (a) Cryopreservation (b) Cytopreservation **(CO4) K1**
   (c) Chemical preservation (d) Cryptopreservation
9. The transgenic fish can tolerate low temperature is---------- **(CO5) K2**
   (a) Tilapia (b) Carp
   (c) Salmon (d) Zebra fish
10. Super bug was developed by ---------- **(CO5) K1**
    (a) Lindeman (b) Anand Mohan Chakravarty
    (c) Lederbery (d) Thomas Koch

PART-B (5 X 5 = 25 Marks)

Answer All questions choosing either (a) or (b)

Each answer should not exceed 250 words:

11. (a) Write notes on lambda vector
    (or) **(CO1) K3**
    (b) Describe briefly about the electroporation
12. (a) Write short notes on RAPD

(or) **(CO2) K4**

(b) Describe briefly about DNA probe

13. (a) Briefly describe the types of animal tissue culture media

(or) **(CO3) K3**

(b) Give a brief account on animal cloning

14. (a) Write a short note on artificial enzyme

(or) **(CO4) K3**

(b) Describe the applications of enzymes

15. (a) What is meant by Trangenesis ? Explain about it

(or) **(CO5) K5**

(b) Explain the applications of r- DNA technology

PART-C (5 X 8 = 40 Marks)

Answer All questions, choosing either (a) or (b)

Each answer should not exceed 600 words:

16. (a) Explain the methods to introduce recombinant DNA into the host cell **(CO1) K4**

(or)

(b) How can you screen and select the recombinants ?

17. (a) Describe the blotting techniques in biotechnology **(CO2) K3**

(or)

(b) Explain the DNA finger printing technology.

18. (a) Explain in detail about human genome Project **(CO3) K4**

(or)

(b) Describe the organ culture techniques and its applications.

19. (a) Write a detailed account on immobilization of enzymes **(CO4) K4**

(or)

(b) Explain in detail about cryopreservation

20. (a) Explain in detail about human genome project **(CO5) K5**

(or)

(b) Describe in detail about solid waste management using biotechnology

CORE COURSE: 6.3
BIOSTATISTICS, COMPUTER APPLICATIONS AND BIOINFORMATICS

L	T	P	C
5	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- understand the mathematical principles of biological systems incorporating computer systems.
- explore the integration and application of statistics and bioinformatics in biology.
- acquire the skills and perspectives of statistics and bioinformatic tools in analysis and interpretation of data.
- gain an insight about the molecular databases.

COURSE OUTCOMES (COs):

On successful completion of the course the student will be able to

CO 1: attain an insight on statistical methods for analysis of biological data.

CO 2: undertake statistical operations in biology.

CO 3: gain basic understanding of computer hardware and software and use productive softwares effectively.

CO 4: acquire knowledge on the bioinformatic concepts for analyzing molecular data.

CO 5: analyse and use the bioinformatics tools for advanced sequence alignment, database searches, genome analysis and protein structure studies.

CO 6: understand and critically evaluate the data analysis procedures in publication of molecular biology research.

UNIT I

INTRODUCTION AND BASICS

Definition and Scope: Population and Samples – Types of variables. Collection and sources of data: Primary and secondary data – survey – census. Sampling methods & Sampling procedures.
Classification and Presentation of data: Frequency distribution. Tabulation & Diagramatic representation of data: tables - parts- types; diagrams – line diagram – bar diagram – pie diagram- histogram – graphs. Measures of Central tendency – Calculation of Mean, Mode and Median (Grouped and Ungrouped Data).
(15L)

UNIT II

MEASURES OF DISPERSION

Variance, Range, Standard Deviation and Standard Error, Coefficient of Variation. Chi – square test – Calculation and application, Student's-t Test. Correlation: Introduction, Types, Perfect positive and negative, Linear and Non-Linear methods; Scatter diagram, Karl Pearson's correlation coefficient; Interpretation of the Correlation coefficient.

(14L)

UNIT III

INTRODUCTION TO COMPUTER

Components of Computer: Input devices and Output devices – CPU – Primary and Secondary, Memory operating system. Introduction to MS Office software- covering, word processing, spread sheet and presentation software. MS Word basics: Creating word document – File, Edit, Format, Save menus, adding bullets, numbering and symbols printing. MS Excel – entering and editing cell entries – adjusting row and column height – Pie- bar- line chart preparation. Uses of Internet – Email, Internet Browsing; e-learning tools & resources, World Wide Web (WWW), MS Power point.

(16L)

UNIT IV

BIOINFORMATICS

Introduction: Definition of Bioinformatics – History – Scope and Application of Bioinformatics; Components of Bioinformatics - Bioinformatics in Life Science. Biological Sequence Analysis: Sequence Alignment – Pair wise Sequence Comparison – Multiple Sequence Alignment.

(15L)

UNIT V

MAJOR DATABASES IN BIOINFORMATICS

Nucleic acid sequence databases : NCBI, EMBL – Genbank; Protein sequence database – SWISS – PROT . Database similarity search Tools: BLAST, FASTA – Application of bioinformatics tools. Database Retrieval Tools: ENTREZ – Locus link – Pub Med (Publishers on Medicine); SRS - Protein structure visualizing tools – RasMol, Swiss PDB viewer.

(15L)

(TOTAL: 75L)

Books for reference

BIOSTATISTICS

1. Arora and Mathan. Bio Statistics (5thEdition). Himalaya Publishing House, Ramdoot, Dr.BhaleraoMarg,Girgaon,Mumbai – 400004.
2. Daha, T.K. Biostatitics in Theory and Practics. EMKAY Publications, Post Box No.9410, B-19, East Akrishna Nagar, Swami Dayanand Marg, Delhi-110051.
3. Gurumani. N, An Introduction to Biostatistics (computer Application included) 2nd Edition M.J.P. Publishers, Tamilnadu Book House, 47 Nallathambi street, Triplicane- 600 005.
4. Jasra, P.K.and Gurdeef Raj. Biostatistics, Krishna Prakashan Media(P) Limited, 11, Shivahi Road, Meerut – 250001
5. Parihar and Parihar. Biostatistics and biometry, Student Edition, Agrobios(India) Behind NasraniCinema,Chopasani Road,Hodhpur-342002.
6. Pranab Kumar Banergee. Introduction to Biostatistics (2nd Edition). S. chand& Company Limited, 7361, Ram nager,New Delhi-110055
7. Prasad, S. Elementa of Biostatistics. Rastogi Publications, Gangotri, ShivajiRoad, Meerut 250002.
8. Satguru Prasad – Fundamentals of Biostatistics (Biometry). EMKAY Publication,Post Box No.9410 B-19, East Akrishna Nagar, Swami Dayanand Marg, Delhi-110051.
9. Pagano, M. and K. Gauvreau. Principles of Biostatistics. Thomas Learning,Alps Building,1st floor,56,Janpath,NewDelhi.
10. Satgurau Prasad, Elements of Biostatistics, Rastogi Publications Gangotri,Shivaji Road, Meerut 250002.

COMPUTER APPLICATIONS

1. Krishnamoorthy, R. Computer Programming andapplications.
2. Rajaram, V. Fundamentals of Computers.

BIOINFORMATICS

1.Bal, H.P. Bioinformatics principles and Applications, Tata Mc Graw Hill Publishing Company Limited, No. 444/1 Sri EkambaraNaicker Industrial Estate, Alkapakkam, Porur, Chennai – 600116

2.Dan, E. Krane and Michael L. Raymer.Fundamental concepts of Bioinformatics. Pearson Education (Singapore) PTE Limited, Indian Branch, 482 FIE Patparganj, Delhi-110 092.

3. Ignacimuthu, S. Basic Bioinformatics. Narosa Publishing House Private Limited,35- 36 Greams Road, Thousand Lights, Chennai-600006
4. Ranga, M.M. Bioinformatics, Agrobios (India) Behind Nasranicinema,Chopasani Road, Hodhpur – 342002.
5. C.S.V. Murthy Bioinformatics.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER VI **PART III: CORE COURSE : 6.3 BIOSTATISTICS, COMPUTER APPLICATIONS AND BIOINFORMATICS**															
CO	**COGNITIVE LEVEL**	**PO**							**PSO**						
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-2 Understand**	3	2	0	2	0	0	1	3	3	1	2	3	1	3	2
CO2	**K-3 Apply**	3	2	1	2	1	2	0	2	3	1	2	3	2	3	2
CO3	**K-2 Understand K3 Apply**	1	1	2	3	0	1	3	1	2	0	2	1	1	3	2
CO4	**K-1 Remember K3 Apply**	3	3	2	3	0	1	3	3	3	1	3	3	3	3	3
CO5	**K-5 Evaluate**	3	3	1	3	0	0	3	3	3	0	2	2	2	3	3
CO6	**K-6 Create K-5 Evaluate**	3	2	3	3	0	1	3	2	3	0	2	3	2	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0).

CORE PRACTICAL - IX
BIOSTATISTICS, COMPUTER APPLICATIONS AND BIOINFORMATICS

L	T	P	C
--	--	2	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical courses are enabling the student to

- find the mean, mode, SD,SE and CV using neem leaves.
- calculate the correlation using height and weight of the students.
- acquire the knowledge to use the computer applications.
- get awareness about the types and applications of bioinformatic tools.

COURSE OUTCOMES (COs)

On successful completion of the practical course the student will be able to

CO1: remember the calculation and apply the formulae in their studies.

CO2: use the technology to analyze the results of the experiments.

CO3: understand and evaluate the data in the light of of bioinformatics tools.

CO4: design a biological study to apply the learnt technology.

1. Find out Mean, Median, Mode, Standard deviation, Standard error and Co-efficient of variance using serrations of neem leaves.
2. Calculation of correlation from height and weight of the students..
3. Bar diagram, Histogram, Pie diagram and Frequency curve and polygon - construction.
4. **Models**, **Chart and Photos**: Computer Mouse, CPU, Keyboard, Monitor.
5. Visit to a Computer centre to learn internet browsing and email sending – Compulsory for each student.
6. Take printout from NCBI, EMBL and PubMed and keep it for spot tests.
7. Write some of the file commands and keep for spot tests.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI PART III: CORE PRACTICAL IX BIOSTATISTICS, COMPUTER APPLICATIONS AND BIOINFORMATICS																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-2 Understand**	3	2	3	2	2	3	2	2	3	3	2	3	2	3	3
CO2	**K-5 Evaluate**	3	3	3	2	1	3	2	2	3	3	2	3	2	3	3
CO3	**K-3 Apply**	2	3	3	1	2	3	3	3	3	2	2	2	2	3	3
CO4	**K-6 Create**	2	3	3	1	2	3	3	2	3	2	2	2	3	2	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

SEMESTER VI

CORE COURSE: 6.3 Biostatistics, Computer Applications and Bioinformatics

Time: 3 hrs **Model question** **Maximum : 75 marks**

Section A (10×1=10 marks) **Mapping level**

Choose the correct answer

1 . The process of getting values and facts from an observation is called **(CO1)** **K1**

a **sampling** b. collection of data c. random sampling d. cluster sampling

2. The midpoints of a histogram connected by a straight line is **(CO1)** **K1**
a**.frequency polygon** b.frequency curve c.leptokurtic curve d.platykurtic curve

3. Square of the standard deviation is **(CO2)** **K1**
a.**variance** b.mean deviation c.standard error d.range

4. Correlation coefficient was developed by **(CO2)** **K1**
a. Karl Pearson b.Tippet c.Yates d.Haldane

5. Which one of the following is brain o the computer ? **(CO3)** **K2**

a. ALU b. **CPU** c CRT d. LINUX

6. The word processing program is _____ **(CO3)** **K2**

a. MS-Excel **b. MS- Word** c MS-Powerpoint d. MS-Outlook

7. _____ is a protein sequence database **(CO4)** **K1**

a. EMBL b**. NCBI** c DDBJ d. SRS

8. The BLAST program which compares an amino acid query sequence against protein sequence is **(CO4)** **K2**

a. blastn b. **blastp** c blastx d. thlastn

9. Database similarity search tool is_____ **(CO5)** **K1**

a. MMTK b . **BLAST** c. PROTPARAM d. PDB

10. The program for determining the protein coding regions of DNA sequence is **(CO5)** **K2**

a. Protein Translator **b. Transeq** c Restriction mapper d. Cp Greport

Section B (5×5=25 marks)

Answer the following choosing either A or B

11.a**.** Outline the technique of drawing a pie diagram with an illustration (or) **(CO1) K4**

b) Distinguish between line diagram and simple bar diagram

12.a**.** Analyse the uses of scatter diagrams in the study of relationship between variables. (or)

b. Discuss the technique of testing statistical significance of correlation coefficient **(CO2) K3**

13. a. Write the various input devices of a computer (or) **(CO3) K3**

b**.** Write the procedure for data entry in MS- Excel

14.a. Bring out the scope of bioinformatics (or) **(CO4) K4**

b. Write an account of DNA sequences used in bioinformatics

15.a. Comment on SWISSPROT (or) **(CO5) K4**

b. What is BLAST ? Enlist different BLAST programs with their uses

Section C (5×8=40)

Answer the following choosing either A or B

16.a. What is sampling ? Describe the various sampling techniques employed in biological Investigation (or) **(CO1) K4**

b.The following table shows the age distribution of certain disease reported during the year. Compute the sample mean, median and mode.

Age	10-19	20-29	30-39	40-49	50-59	60-69
Number of cases	5	10	20	22	13	6

17. a. "Dispersion is the degree of scatter of the variable from a central value" – Justify (or)

b. What are the applications of chi-square test in biological research? **(CO2) K3**

18.a. What is website? Describe the process of viewing information stored in internet (or)

b. Write an account on Data Base Management System. **(CO3) K3**

19.a. Write an account on database similarity search tools. (or) **(CO4) K4**

b. Give a brief account of various applications of bioinformatic tools in research on

bioinformatics

20.a. Describe the structure of protein sequence database. (or) **(CO5) K4**

b**.** Write down the details of query DNA and protein sequences obtained from nucleotide and protein databases

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Elective

CORE ELECTIVE (GROUP- A)

(Any one)

CORE ELECTIVE COURSE: 6.4A -SERICULTURE

L	T	P	C
5	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the courses are enabling the student to

- study the scope and importance of Sericulture for betterment of human welfare.
- introduce the concepts of sericulture and mulberry cultivation.
- get deep knowledge on diseases of silk worm and pests of mulberry plants.
- understand the methods of harvesting, and cocoon marketing.
- adopt sericulture as a vocation as it is a rural agro based cottage industry.

COURSE OUTCOMES (COs):

On successful completion of the course the student will be able to

CO1: understand the scope sericulture and mulberry cultivation practices.

CO2: gain knowledge on diseases of silkworms and pests of mulberry.

CO3. understand the classification, life cycle and physiology of silkworm.

CO4. apply the rearing methods, harvesting of cocoon and cocoon marketing.

CO5: examine process of reeling, producing raw silk and marketing.

CO6: decide to start sericulture unit/reeling unit in the local area and become notable entrepreneur.

UNIT I

IMPORTANCE OF SERICULTURE

Sericulture industry in India: Sericulture as cottage industry, role of Central Silk Board, Moriculture: Morphology of Mulberry plant- High yielding varieties –methods of propagation-irrigation. Manuring: Biofertilizers – Green manuring – Triacontanol for increased mulberry productivity – Seriboost. Pruning- Harvesting and storing of mulberry leaves-Package of practices for mulberry cultivation.

(15L)

UNIT II

DISEASES AND PESTS OF MULBERRY

Fungal diseases: fungal root, shoot and leaf diseases; Bacterial diseases: leaf blight disease, rot disease; Viral diseases: mulberry leaf mosaic disease, dawn disease; Dwarf disease, Nematode diseases: root knot disease; Deficiency diseases: nitrogen deficiency, phosphorus deficiency, potassium deficiency, magnesium deficiency and calcium deficiency diseases; Pests of mulberry: leaf eating insect pests and stem borer pests one example each.

(15L)

UNIT III

BIOLOGY OF SILKWORM

Classification of Mulberry silkworm- habit and habitats; Voltinism- races of silkworms; Life cycle- Structure of egg- larva- pupa and adult- Sexual dimorphism. Digestive system-circulatory system- excretory system- respiratory system, nervous system and reproductive system, endocrine and other glands of Silkworm.

(15L)

UNIT IV

REARING OF SILKWORM COCOON MARKETING

Rearing house (CSB model) - Rearing appliances. Rearing operation: Disinfection – Brushing – Maintenance of optimum conditions, Feeding – Bed cleaning – Spacing. Methods of Rearing; Young age worms – Chawki rearing - Rearing of late age larva-Types: Shelf rearing. Floor rearing, Shoot rearing- Application of Sampoorna. Mounting: Mountages- Methods – Precautions. Cocoon marketing: Characteristics of cocoon- – defective cocoons – methods of harvesting. – Shell ratio and rate fixation.

(15L)

UNIT V

DISEASES AND PESTS OF SILKWORM & REELING

Protozoan disease: Pebrine; Viral diseases: Flacherie, Gattine, Grasserie; Bacterial diseases: Flacherie, Septicemia, Sotto, Court; Fungal diseases : Muscardine; Pests: Uzy fly, Dermistid beetle of silkworm. Silk reeling: Cocoon stifling – types- storage of stifled cocoons- sorting-cocoon boiling and deflossing – brushing, Process of reeling: Different methods- silk waste and byproducts of silk reeling- Raw silk and marketing.

(15L)

(TOTAL: 75L)

Books for reference

1. Ganga, G. and I. Sulochana Chetty, An introduction to Sericulture. Oxford & IBH Publishing Company Private Limited, S -155,Panchshila Park, New Delhi.

2. Ganga,G. Comprehensive Sericulture, Volume – 2 Silkworm Rearing and Silk Realing. Oxford & IBH Publishing Company Private Limited, S -155, Panchshila Park,New Delhi.
3. Dandin, S.B, Jayant Jayaswal and K. Giridhas, Hand Book of Sericultural Technologies, Central Silk Board, Madivala, Bangalore –68.
4. Kamile Afifa. S and Masoodi M. Amin, Principles of Temperate Sericulture,Kalyani Publishers, B – 1/1292,Rajinder Nagar, Ludhians.
5. Kesary, M and M.Johnson, Sericulture, Department of Zoology, N.M.. Christian College, Marthandam.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI PART III: CORE ELECTIVE COURSE:6.4A- SERICULTURE															
CO	**COGNITIVE LEVEL**	**PO**							**PSO**						
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	3	2	3	2	2	3	3	2	2	1	1	3	3
CO2	**K-2 Understand**	3	3	3	2	3	3	3	3	3	2	2	1	1	3	3
CO3	**K-3 Apply**	3	3	3	2	3	3	3	3	3	2	2	1	1	3	3
CO4	**K-4 Analyse**	3	3	3	2	3	3	3	3	3	2	2	1	1	3	3
CO5	**K-5 Evaluate**	3	3	3	2	3	3	3	3	3	2	2	1	1	3	3
CO6	**K-6 Create**	3	3	3	2	2	3	3	3	3	2	2	1	2	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0).

CORE ELECTIVE PRACTICAL- X (Any two)
6.4A SERICULTURE

L	T	P	C
--	--	2	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the student to

- observe and analyse the features of silk gland, digestive and nervous system of silkworm.
- realize the importance selection of leaves for feeding.
- examine and analyse the stages development.
- assess the mulberry varieties, rearing and mounting appliances and marketing of cocoons.
- promote sericulture industry in rural area.

COURSE OUTCOMES (COs)

On successful completion of the practical course the student will be able to

CO1: understand the biological importance systems of the silkworm.

CO2: appreciate the importance of feeding and rearing appliances

CO3: enhance the production by applying scientific knowledge and training.

CO4: decide to have a sericulture unit with less input.

PRACTICALS

1. Dissection of silk glands, digestive and nervous systems- Silk worm
2. Dissection of male and female reproductive system- Silk worm
3. Selection of mulberry leaves according to different stages of the larva.
4. Life history Silk worm – egg, larva, pupa and adult.
5. Sexual dimorphism in larva, pupa and adult- Silk worm
6. Mulberry varieties such as MR2, S30, S36, V2. (any four)
7. Chandrika and Netrika
8. Rearing tray and rearing stand.
9. Raw silk and silk waste
10. Cocoon- Bivoltine/ Multivoltine

11. Report on field visit to Sericulture farm/ unit. (Mandatory)

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI PART III: CORE ELECTIVE PRACTICAL X: SERICULTURE															
CO	COGNITIVE LEVEL	PO							PSO						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8

CO1	**K-2 Understand**	3	2	3	2	2	3	2	2	3	3	2	3	2	3	3
CO2	**K-5 Evaluate**	3	3	3	2	1	3	2	2	3	3	2	3	2	3	3
CO3	**K-3 Apply**	2	3	3	1	2	3	3	3	3	2	2	2	2	3	3
CO4	**K-6 Create**	2	3	3	1	2	3	3	2	3	2	2	2	3	2	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

B.Sc Zoology (CBCS) DEGREE EXAMINATION

Semester VI

Time: 3 Hrs Core Elective 6.4A -SERICULTURE Maximum: 75 Marks

Part A (10x1=10 marks)

Answer All Questions

Choose the correct answer Mapping level

1.The study of mulberry plant is **(CO1) K1**

a.Sericulture b. **Moriculture** c.Vermiculture d.Noriculture

2.The rearing of silkworm is called **(CO1) K1**

a. Moriculture b. **Sericulture** c. Apiculture d. Silviculture

3.Silk glands are modified **(CO2) K2**

a. serum glands b. **labial glands** c. thoracic glands d. sebacious gland

4.Moulting occurs ----------the during the life span of silkworms **(CO2) K2**

a. **4 times** b.3 times c.2 times d.1 time

5.Mature larvae is used for **(CO3) K1**

a.rearing b. reeling c. moulting d. **mounting**

6.Muscardine is **(CO3) K1**

a. **fungal disease** b. bacterial disease c. viral disease d. protozoan disease

7.Disinfection of diseased larvae is done by **(CO4) K2**

a.2% hydrochloric acid b.2% sulphuric acid c.**2% formalin** d.2% nitric acid

8. The quality of silk is assessed on the basis of ---------- of cocoon **(CO4) K2**

a. strength b. colour c. **shell ratio** d. shape

9.Shoot borer pest of mulberry is **(CO5) K1**

a.stick insect b.mites c.**termites** d.snails

10.Uzi-fly is a **(CO5) K1**

a.minor pest b. **major pest** c.bacteria d. protozoa

PART B- (5x5=25 marks)

Answer all questions, choosing either (a) or (b)

11.a. Examine the importance of sericulture industry (Or) **(CO1) K**4

b.Explain the varieties of mulberry plant

12.a. Give an account on fungal leaf disease. (Or) **(CO2) K3**

b. List out the nitrogen deficiency effects on mulberry growth

13.a. Comment on Silk worm. (Or) **(CO3) K5**

b. Evaluate the functions of silk glands of silkworm

14. What are the uses of silk industry wastes?(Or) **(CO4) K4**

b. Explain the importance of brushing in rearing

15.a. Write a brief note on raw silk. (Or) **(CO5) K3**

b.Write a brief note on Chawki rearing

PART C- (5x8=40 marks)

Answer all questions, choosing either (a) or (b)

16.a. Explain the morphology of mulberry plant .(Or) **(CO1) K4**

b. Explain the methods of propagation of mulberry

17.a.Write the bacterial diseases of mulberry plant. (Or) **(CO2) K3**

b. Give an account on the pest of mulberry

18.a.Explain the life cycle of Bombyx mori. (Or) **(CO3) K4**

b.Elucidate the role of endocrine glands of silk worm.

19. a. Explain the various rearing appliances used in silkworm rearing. (Or) **(CO4) K3**

b. What is spacing explain it in detail.

20.a. Write an essay on muscardine. (Or) **(CO5) K4**

b. Describe about reeling operation.

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Elective

CORE ELECTIVE (GROUP- A)

CORE ELECTIVE COURSE: 6.4B AQUACULTURE

L	T	P	C
5	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- familiarize the aquaculture potential and practices in India.
- impart knowledge on fish culture techniques to augment food production from aquatic resources.
- impart knowledge on health management, feed formulation and fish preservation.

COURSE OUTCOMES (COs):

On successful completion of the course the student will be able to

CO 1: understand the biology and culture techniques of commercially important food fishes.

CO 2: analyse the basic culture methodologies of culturable species and integrated fish farming.

CO 3: acquire knowledge on feed organisms and feed formulations.

CO 4: identify common diseases, manipulation of condition factors and to apply health management measures.

CO 5: interpret different techniques of processing, preservation and marketing of fish.

CO 6: apply principles to handle the problems encountered in commercial production if self employed with aquaculture unit.

UNIT I

INTRODUCTION

Definition, scope of aquaculture, cultural techniques, Aquaculture in India – Freshwater, Coastal and marine aquaculture – Culturable organisms – Fin fishes, Shell fishes and their qualities.

(15L)

UNIT II

PREPARATION OF POND

Types of fish ponds: Nursery pond, rearing pond and culture pond. Fin fish culture : Culture of Indian major carp – Bundh breeding, Induced breeding, Transport of fish seeds. Shell fish culture: Culture of marine prawn – Induced breeding – Types of prawn culture in India. Edible Oyster culture and Pearl Oyster culture.

(15L)

UNIT III

TYPES OF CULTURE PRACTICES

Extensive, Semi-intensive and Intensive culture, Monoculture, Monosex culture, Polyculture, Cage culture, Pen culture. Integrated fish farming – Paddy cum fish culture. Animal husbandry cum fish culture, Sewage fed fish culture.

(15L)

UNIT IV

FISH FEED AND DISEASES

Artificial feed: feed formulation, feed ingredients, pellets. Live feeds and their culture: Artemia, Diatoms, Rotifers, Micro Algae. Parasites and Diseases of aquaculture organisms: Ectoparasites and Endoparasites; Bacterial, Viral and Fungal diseases – Nutritional deficiency diseases.

(15L)

UNIT: V

GOVERNMENT BOARDS AND MARKETING

CMFRI, CIFRI, MPEDA, FFDA. Post harvest technology in fishes – Rigor mortis, fish spoilage, fish preservation techniques – freezing, canning, drying. Fish marketing; Co-operative marketing in fisheries. Craft and gears. Water quality management.

(15L)

(Total: 75L)

Books for reference

1. Beavan, R. Handbook of Freshwater Fisherries on India. Narendra Publishing House,1417, Kishan Dutt street, Maliwara, Delhi – 110 006.

2. Biswas, K.P. Prevention and control of fish and prawn diseases, Narendra Publishing House,1417, Kishan Dutt street, Maliwara, Delhi – 110 006.

3. Dash, M.C. & P.N. Patnik, Brackish Water Prawn Culture, Palani Paramount Publications,69-D.,Anna Nager, Palani – 624602.

4. Dick Mills, Tropical Aquarium Fishes, Chencellor Press, Michelin House,81,Fulham Road, London SW3 6RB.

5. Jhingaran, V.G. Fish and Fisheries of India, Hindustan Publishing Corporation (India), Delhi.

6. Khanna, S.S. Introduction of fishes, Central Book dept, Allahabad.

7. Latha Shenoy, Course Manual in Fishing Technology Central Institute of Fisheries Education (Indian Council of Agricultural Research), Versova, Bombay – 400061`.

8. Mary Chandy, Fishes. National Book trust.A-5,Green Park, New Delhi – 110 016.

9. Pandian, T.J., Sustainable India Fisheries. National Academy of Agricultural Sciences. ICAR, Ministry of Agriculture, New Delhi.

10. Parihar, R.P. A Text Book of Fish Biology and Indian Fisheries. Central Publishing House, Allahabad.

11. Rath, R. K. Freshwater Aquaculture. Scientific Publishers.5A.New Pali Road, Jodhpur, 342001.

12. Santhanakumar, G & A.M. Selvaraj. Concepts of Aquaculture. Meenam Publications. Nagercoil Lekshmi Papers, Thirumal Complex, Opp. Chakkaravarthi theatre. Chettikulam Jn., Nagercoil – 629 002.

13. Sebastian. CD. A Manual on seed production and Farming of gaint Freshwater prawn Macrobrachium Rosenbergii. The Marine Product Export Development Authority MPEDA House, Panampilly Avenue, Kochi – 682 036.

14. Srivastava, C.B.L. A Text Book of Fishery Science and Indian Fisheries. Kitab Mahal Distributors,28,Netaji Subash Marg, New Delhi – 110 002.

15. Sundararaj, V. & B. Srikrishnadhas, Cultivable Aquatic Organisms, Narendra Publishing House,1417, Kishan Dutt street, Maliwara, Delhi – 110 006

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI PART III: CORE ELECTIVE COURSE – 6.4B AQUACULTURE																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember K-2 Understand**	3	2	2	2	1	3	2	3	2	2	3	1	3	3	3
CO2	**K-4 Analyse**	3	2	3	2	3	3	3	3	3	2	3	2	1	3	3
CO3	**K-2 Understand**	3	2	3	3	3	3	3	3	3	2	2	2	2	3	3
CO4	**K-4 Analyse K-3 Apply**	3	3	3	2	2	3	3	3	3	2	3	2	1	3	3
CO5	**k-3 Apply K-5 Evaluate**	3	3	3	3	2	2	3	3	3	2	2	2	2	3	3
CO6	**k- Apply K-6 Create**	3	3	3	2	3	3	3	2	3	2	3	2	2	3	3

Strongly correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Elective Practical

CORE ELECTIVE PRACTICAL : PRACTICAL- X

6.4B AQUACULTURE

L	T	P	C
--	--	2	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the students to

- know the procedure for the estimation of physicochemical parameters of fish pond.
- understand the different species of culturable organisms.

- gain knowledge about the maintenance and management of fish farm from field visit.

COURSE OUTCOMES (COs)

On successful completion of the practical course the student will be able to

CO1: test the parameters relevant to establish a fish farm.

CO2: asses the qualities of culturable species.

CO3: appreciate the adoptable qualities for selection.

CO4: solve the encountered problems scientifically and reasonably.

PRACTICALS

1. Determination of pH in two water samples using pH meter.
2. Estimation of Salinity, Dissolved Oxygen and Alkalinity in two water samples.
3. Mounting- Placoid, Cycloid and Ctenoid scales.
4. **Museum specimens, slides, models and charts:**

Catla, Rogu, Mrigal, Channa, Penaeus, Crossostrea, Raft culture, Pinctada, Argulus, Lernaea.

5. Field Visit to Aquaculture unit/ Fish farm- Report (Mandatory)

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI PART III: CORE ELECTIVE PRACTICAL X: AQUACULTURE																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-3 Apply**	3	2	3	2	2	3	2	2	3	3	2	3	2	3	3
CO2	**K-5 Evaluate**	3	3	3	2	1	3	2	2	3	3	2	3	2	3	3
CO3	**K-4 Analyse**	2	3	3	1	2	3	3	3	3	2	2	2	2	3	3
CO4	**K-6 Create**	2	3	3	1	2	3	3	2	3	2	2	2	3	2	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

SEMESTER VI

CORE ELECTIVE -6.4B AQUACULTURE

Time: 3 Hrs **Maximum : 75 Marks**

Section A (10×1=10)

Choose the correct answer

1. Artificial recruitment in seas by seeds produced in fish hatcheries is called
a**. sea ranching** b. noriculture c. mariculture d. metahaline-culture **CO1) K1**

2. Which one of the following is silver carp? **(CO1) K1**

a. ***Hypophthalmichthys molitrix*** b. *Ctenopharyngodon idella*

c. *Cyprinus carpio* d. *Heteropneustes fossilis*

3. Spat refers to the seeds of **(CO2) K2**

a. **oyster** b. prawn c. Clarias d. Mrigal

4. Which one among the following is a synthetic hormone used in

induced breeding? **(CO2) K1**
a. Ovaprim b. Oestrogen c. Oxytocin d. Androgen

5 The fish suitable for paddy cum fish culture is **(CO3) K1**

a. Mystus b. Tuna c**. Common carp** d. Silver carp

6. Which of the following statement is correct? **(CO3) K1**

a. **Fishes are fed with artificial feed in intensive culture**
b. Fishes are fed with artificial feed in extensive culture

c. Stocking density is low in intensive culture

d. Stocking density is high in extensive culture

7. The eggs of artemia are called as **(CO4) K1**
a. **cyst** b. pen c. silver pearl d. spat

8.Dropsy is caused by _____ **(CO4) K1**

a. **Aeromonas** b. Bacillus c. Pseudomonas d. Proteus

9. Where is the headquarters of CMFRI at present ? **(CO5) K1**

a. **Cochin** b. Chennai c. Mandapam d. Hydra

10. CMFRI is **(CO5) K2**

a. Central Marine Fish Research Institute

b. **Central Marine Fisheries Research Institute**

c. Central Marine culture Fish Research Institute

d. Central Marine Farm Research Institute

Section B (5×5=25)

Answer the following choosing either a or b

11. a. Bring out the importance of aquaculture. (or) **(CO1) K3**

b. Enumerate the desirable qualities of cultivable organisms.

12.a. Discuss bundh breeding in carps. (or) **(CO2) K4**

b. Give a brief account on various types of fish pond.

13.a. Discuss the significance of animal husbandry cum -fish culture (or) **(CO3) K4**

b. Write a short account on semi – intensive culture

14.a. List out the criteria for a good quality artificial feed (or) **(CO4) K3**

b.Enumerate and explain the crustacean parasites attacking fish

15.a. Explain the marine fish marketing-system (or) **(CO5) K3**

b.Bring out the water quality management strategies in aquaculture

Section C (5×8=40)

Answer the following choosing either (a) or (b)

16.a. Write an account on coastal aquaculture in India (or) **(CO1) K4**

b. Discuss the various fin fishes and shellfishes suitable for culture practice.

17.a. Elaborate the technique of induced breeding in fish (or) **(CO2) K4**

b. Bring out the steps involved in pearl oyster culture

18.a. Elaborate the different types of integrated fish farming (or) **(CO3) K1**

b. Explain the sewage fed fish culture

19.a. Elucidate the importance of live feed and their culture (or) **(CO4) K5**

b. Analyze the nutritional deficiency diseases of fish and the ways by which it could be managed by balanced feed formulation

20.a. Analyze the preservative techniques adopted in fish preservation. (or)

(CO5) K5

b.Bring out the crafts and gears used in aquaculture

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Elective

CORE ELECTIVE (Any one)
(GROUP- A)
6.4 C- DAIRY PRODUCTION TECHNOLOGY

L	T	P	C
5	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- give an account on different breeds of dairy cattle.
- study their characteristics and performance, the factors affecting their health.
- describe construction, maintenance of sheds.
- introduce the growing and maintenance and disease managements of dairy animals.
- know the technologies that help artificial insecure ELECTIVE COURSEmination and genomic testing.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: remember the importance, breed types and breeding technologies for future usage.
CO2: understand the selection, growing and maintenance of dairy animals.{
CO3: apply the knowledge of nutrient on feeding lactating cow.
CO4: acquire the skill to manage a dairy farm or to start one with adequate input.
CO5: identify the disease and adopt correct treatment.
CO6: evaluate and formulate marketing technique for dairy products in a profitable way.

UNIT I

IMPORTANCE OF THE STUDY

History and future of Live stock in India – Live stock reproduction – Organs – Fertilization – Artificial Insemination – Inheritance – Hybrids – Hybrid Vigor – Grading – Pure breeds – Inbreeding.

(15L)

UNIT II

NUTRITION

Source of feed- Feed composition- Nutrient for milk production- water, energy, protein, fibre, vitamins and digestibility. Nutritive values of common feeds – Commercial and mixed feeds – Balance ration.

(15L)

UNIT III

DAIRY ANIMALS AND MANAGEMENT

Milching breeds- Cattle: Cow – Buffaloes – Goat – Their economic importance – Productivity. Managing dairy cattle- Breed selection- Indian native and exotic breeds.

(15L)

UNIT IV

HOUSING AND DISEASE MANAGEMENT

Dairy shed design, Cooling strategies- Animal sign management, Cow compost management, Calf management, Dairy herd management, Growth, Cow health and reproductive management, Breeding, Maternity management. Lactation cycle management and Common management.

Live stock diseases – Common parasites in India – Treatment. Vaccination, Deworming, Weaning etc.,

(15L)

UNIT V

MILKING AND MARKETING MILK PRODUCTS

Milking Management: Gathering cow for milking; Milking machines for smallholders; cleaning and sanitizing dairy equipment; Milking procedure. Dry cow therapy; Milk filtration Management. Milking Hygiene; Post-harvest milk quality.

Milk and other dairy products –Milk, cheese, ghee, butter, yoghurt, gluten, milk powder etc., Nutritive values of fresh and preserved products – Combating spoilage of milk – Souring – Gassy Curdling – Robiness – Sweet curdling – Pasteurization.

(15L)

(TOTAL 75L)

Books for reference

1. Principles of Dairy Chemistry. Janness, Robert and Sturte Patton; WielyEastern.
2. Artificial Insemination in Farm animals: Perry Enos (Eds.) Oxford &IBH.
3. Breeding and Improvement of Farm animals: Rice, Victor, Arthur; Tata MCGraw Hill.
4. Livestock and Poultry Production: Singh, Herbans and Earl Moore; Prentice Hallin India.
5. Klaus, A. J. (2015). Dairy Farming: The Beautiful Way
6. Leitch, A. (2018). The Dairy Farm: Dairy Cattle Methods, and Dairy Farm Management

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI PART III: CORE ELECTIVE COURSE : 6.4C- DAIRY PRODUCTION TECHNOLOGY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	2	3	3	2	2	-	1	3	2	1	2	2	1	1	2
CO2	**K-2 Understand**	3	3	3	2	2	3	2	3	3	3	4	3	3	2	3
CO3	**K-3 Apply**	2	3	3	2	3	2	3	3	3	3	3	3	3	3	2
CO4	**K-4 Analyse**	2	3	3	2	3	1	3	3	2	3	2	3	3	2	3
CO5	**K-5 Evaluate**	2	2	2	-	2	3	3	3	2	3	2	3	2	3	3
CO6	**K-6 Create**	2	-	3	-	2	2	3	3	2	2	2	3	3	3	3

Strongly Correlated (3); Moderately Corr1elated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Elective Practical

CORE ELECTIVE PRACTICALS- X

6.4C DAIRY PRODUCTION TECHNOLOGY

L	T	P	C
--	--	2	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical courses are enabling the students to

- know the various tests to find the quality of milk.
- identify the cattle breeds by their distinguishing characters with examples.
- study the methods of preservation methods of milk and milk products.
- get an idea for starting dairy farm by periodical visits.

COURSE OUTCOMES (COs):

On successful completion of the practical course the student will be able to

CO1: understand dairy production technology is the need based industry and realizes the demand of milk supply.

CO2: apply the knowledge on the selection of feed types and their nutritional status.

CO3: analyze and evaluate the safety and profitable way to start dairy unit.

CO4: set a goal to open dairy processing unit and marketing the dairy products. **PRACTICALS**

1. Visit to Pasteurization plant and reporting.
2. On the spot tests of pure milk – Specific gravity, total solids and adulteration of milk.
3. Demonstration of Dairy products – Cream, Butter, Ghee, Khoa, and Ice cream.
4. Identification of cattle diseases – Prevention and Cure-Method of taking temperature in cows.
5. Preparation of Cattle Feed-Balanced food – Identification of different feed plants.
6. Artificial Insemination – Common Surgical Instruments and their uses.
7. Periodical visit to a Good Dairy Farm and Reporting. (Mandatory)

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI **PART III: ELECTIVE PRACTICAL X : DAIRY PRODUCTION TECHNOLOGY**																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-3 Apply**	3	2	3	2	2	3	2	2	3	3	2	3	2	3	2
CO2	**K-4 Analyse**	3	3	3	-	2	3	2	2	3	3	2	3	2	3	2
CO3	**K-5 Evaluate**	2	3	3	-	2	3	3	2	3	2	2	2	2	3	3
CO4	**K-6 Create**	2	3	3	1	2	3	3	2	3	2	2	2	3	2	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Elective

CORE ELECTIVE (GROUP B)- Any one

CORE ELECTIVE COURSE: 6.5A -APICULTURE

L	T	P	C
4	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- familiarize the organization of bee colony
- know the systematic planning of apiary unit.
- get knowledge about the value of honey and harvesting techniques.
- understand the disease and enemies and behaviour of honey bees.
- examine the scope for self employment opportunities. give self-employment opportunities after their graduation
- provide rural based and welfare oriented knowledge.

COURSE OUTCOMES (COS)

On successful completion of the course the student will be able to

CO1: classify the honey bees and categorize its developmental stages and explain the principles of Apiculture and methods of Bee keeping.

CO2: construct modern hives and rear and recommeds apiary as a less expensive but profitable self employment.

CO3: make use of Honey bee products and marketing.

CO4: distinguish the enemies of bees and protect the bees from various diseases. and identify swarming, robbing and foraging behaviour of bees in an apiary.

CO5: trust the less expensive but profitable self employment.

CO6: gain confidence to establish an apiary after their graduation as a rural based and welfare oriented venture.

UNIT I

INTRODUCTION

Definition, Scope, Classification of bees: Rock bee, Indian bee, Little bee and Dammer bee- their identification and habits, choice of species in Apiculture.

Bee colony: Distinctive features, Identification and Functions of queen, drones and workers, Structure and functions of legs, mouth parts and sting of worker bee. Development of Honey bee: egg, larva and pupa- time taken for the development of queen, drone and worker. Food of the bee: bee bread, honey and pollen- royal jelly- propolis. Artificial feeding.

(12L)

UNIT II

PRINCIPLES OF APICULTURE

Arranging an Apiary: position- space- direction. Acquiring bees: care of newly captured colonies- handling the bees. Bee keeping: Primitive methods - their advantages and disadvantages. Different types of Modern hives: Architecture - Parts of artificial hive and its advantages – other appliances used in apiary The bee comb and its architecture-Different kinds of cells-Burr comb.

(12L)

UNIT III

HONEY BEE PRODUCTS

Honey: Collection and Extraction, Preservation and storage –Physical properties, Chemical composition, nutritive value, medicinal values- honey as daily food.

Bee wax- Production - method of extraction- characteristics and uses.

Bee venom- method of collection - composition of venom- its uses.

(12L)

UNIT IV

ENEMIES AND DISEASES OF BEES

Enemies: Greater wax moth, lesser wax moth, ants, wasps, lice, beetles, birds and their management.

Diseases of bees: adult and brood diseases- Bacterial, Fungal, Viral & Protozoan- Prevention and Control measures.

(12L)

UNIT V

SWARMING AND OTHER BEHAVIOURS

Swarming- Prevention and control. Robbing and Fighting- Prevention and control. Uniting stocks- Different methods. Queen rearing. Supersedure. Foraging, inter-relationships of plants and bees. Behaviour of bees- bee dances.

(12L)

(TOTAL: 60L)

Books for reference

1. Mishra,R.C. &R. Garg. Perspectives in Indian Apiculture. Agrobios (India)behind Nasrani Cinema, Chopasani Road, Jodhpur-342002.
2. Abrol,D.P. Bee Keeping in India. Kalyani Publishers, B-1/1292, Rajinder Nagar,Ludhiana-141 008.
3. Cherian, M.C. &Ramachandran. Bee Keeping in SouthIndia.
4. Philips, E.F. Bee Keeping,Agrobios (India) behind NasraniCinema,Chopasani Road,Jodhpur-342 002.
5. Sadar Singh, Bee Keeping in India Kar Delhi.
6. Sharma P.L and Singh, S.(controller) Hand Book of bee Keeping, printing and Stationery,Chandigarh.
7. Webb,A. Bee Keeping for profit and Pleasure, Agrobios (India), Behind Nasrani Cinema, Chopasani Road, Jodhpur-342002 .

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI PART III : CORE ELECTIVE COURSE – 6.5A: APICULTURE																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	2	2	3	2	2	3	2	2	2	2	3	2	2
CO2	**K-2 Understand**	2	3	3	2	3	2	3	3	3	3	2	2	3	2	2
CO3	**K-3 Apply**	2	3	3	2	3	2	3	3	3	3	2	3	3	2	2
CO4	**K-4 Analyse**	2	3	3	2	3	3	3	3	2	3	2	3	3	3	3
CO5	**K-5 Evaluate**	1	2	2	2	2	3	3	2	2	3	3	3	3	3	3
CO6	**K-6 Create**	1	1	2	1	2	2	3	2	2	3	1	2	2	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Elective Practicals

CORE ELECTIVE PRACTICALS- X
6.5A APICULTURE

L	T	P	C
---	--	2	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the student to

- observe and mount legs, mouth parts and sting of workers to appreciate their diversified functions.
- compare the features of the colony members.
- relate the structural modifications with the functions
- practice the procedures for handling the bees and hygienic extraction of honey/
- motivate to start an apiary unit.

COURSE OUTCOMES (COs)

On successful completion of the practical course the student will be able to

CO1: identify and characterize the members of the colony.
CO2: describe the structure and management of the colony.
CO3: adopt suitable methods to handle the bees safely.
CO4: plan to develop a modern apiary and marketing honey with self involvement and interest.

PRACTICALS

1. Mountings of legs, mouth parts and sting of worker bees.
2. **Specimen**, **Model**, **Slide and Appliances**:
   Queen, Worker, Drone, Artificial hive (Newton hive), Queen excluder, smoker, honey extractor, honey, scraffing knife, Bee comb, Bee veil and Comb foundation sheet.

3. Report on field visit to Apiary farm/ unit. (Mandatory)

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI PART III: CORE ELECTIVE PRACTICAL X : APICULTURE																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-2 Understand**	3	3	3	2	2	1	2	3	2	2	2	3	2	2	3
CO2	**K-3 Apply**	3	3	2	2	2	2	3	3	3	2	2	3	3	3	3
CO3	**K-4 Analyse**	3	3	2	2	2	3	3	3	3	3	2	3	3	3	3
CO4	**K-6 Create**	2	3	2	2	2	3	3	3	2	2	2	3	2	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Elective

CORE ELECTIVE COURSE (GROUP B)- Any one
6.5B-FOOD AND FOOD PROCESSING TECHNOLOGY

L	T	P	C
4	--	--	4

LEARNING OBJECTIVES (LOs)
The objectives of the course are enabling the student to

- know the physical and chemical properties of food stuff.
- study the principles and methods of food processing.
- familiarize the safe methods of preparation of palatable diets.
- apply the techniques employed to increase their shelf – life.
- practice the various methods of processing for different types of food.

COURSE OUTCOMES (COs)
On successful completion of the course the student will be able to
CO1: recall the physicochemical properties of different types of food stuff.
CO2: understand and describe the procedure of processing and preservation of food.
CO3: test and practice the milk processing technology.
CO4: adopt the strategies for fruits and vegetable preservation.
CO5: evaluate the value of preservation of food from animal sources.
CO6: make a firm decision to establish a food processing unit based on the locally available food resource.

UNIT I

FOOD CHEMISTRY

Definition- importance of water in food, water activCOURSE OUT COMESity and shelf life of food. Carbohydrates: Chemical reactions, functional properties of sugars and polysaccharides i Lipids: Classification and use of lipids in foods, physical and chemical properties, effects of processing on functional properties and nutritive value. Protein and amino acids: physical and chemical properties, distribution, amount and functions of proteins in foods. Effects of processing- Losses of vitamins and minerals due to processing. Pigments in food, food flavours, browning reaction in foods. Enzymes in foods and food industry, Bio-deterioration of foods, food contaminants, additives and toxicants.

(12L)

UNIT II

PRINCIPLES OF FOOD PROCESSING

Scope and importance food processing – National and International perspectives. Principles and methods of food preservation – freezing, heating, dehydration, canning, additives, fermentation, irradiation, extrusion cooking, hydrostatic pressure-cooking, dielectric heating, microwave processing, aseptic processing, hurdle technology. Storage of food, modified atmosphere packaging. Refrigeration , freezing and drying of food, Minimal processing, Radiation processing.

(12L)

UNIT III

MILK PROCESSING TECHNOLOGY

Definition of milk, composition, physical and chemical properties of milk Constituents and nutritive value of milk, Factors affecting composition of milk, Types of milk. Fluid Milk. Processing- Receiving, Filtration Clarification, Straining, Standardization, Homogenization and its effects. Pasteurization and various systems of pasteurization ; LTLT, HTST, UHT methods, Pasteurizes (Heating and Cooling systems, Flow controller regenerator, Flow division valve)- sterilization, packaging of fluid milk.

Coagulated Milk Products. Channa, Paneer, Classification and manufacturing process of cheese, butter and ghee and its storage.

Condensed Milk - Types and factors affecting the quality of Condensed Milk, Storage of condensed milk - Methods of drying milk (Drum and Spray drying) - factors affecting the quality of dry milk- introduction to instant non-fat dry milk- packaging of dry milk products.

(12L)

UNIT IV

FRUITS AND VEGETABLES TECHNOLOGY

Cleaning, sorting, grading, peeling, and blanching methods and their equipments, ingredients and processes for the manufactures of jam, jellies, marmalade, preserves, pickles and chutneys. Defects and factors affecting the quality of above.

Thermal Processing of Fruits and Vegetables: History, definition, various techniques of thermal processing and their effects on the quality of fruits and vegetable products, thermal process time, introduction the concept of thermal process calculations, types of containers and their selection, spoilage of canned food.

Dehydration of fruits and vegetables: equipment and process for dehydration of plums, apricot, apple, fig, grapes, peach, cauliflower, potato, mushroom, tomato. Freezing process of selected fruits and vegetables: peas, beans, cauliflower, apricot and mushroom.

(10L)

UNIT V

TECHNOLOGY OF MEAT, FISH AND POULTRY PRODUCTS

Slaughter of meat animals, different cuts of lamb and their uses, post-mortem inspection – post mortem changes- Loss of homeostasis, post-mortem glycolysis and pH decline, Rigor mortis. Preparatory operations of meats and meat products: Abattior- definition and construction, Basic preparatory procedures (commintion, emulsification, preblending). Cured and smoked meats, sausage products- classifications, processing steps and canned meat, meat pickles.

Handling and Dressing of poultry: Inspection of poultry birds, dressing and preparation of ready to cook poultry, factors affecting the quality- Egg and Egg products- structure, chemical composition and nutritive value, spoilage of eggs and preservation of whole eggs and egg products, preparation of egg powder. Fish and fish products: Types of fish, composition and nutritive value, judging and freshness of fish, fish grading and cooking of fish, smoking, pickling, salting and dehydration, preservation of fish and processed fish products. Frozen storage of fresh and processed meat, fish and poultry. Byproducts of fresh and processed meat, fish, poultry and egg industry.

(14 L)

(TOTAL: 60L)

Books for reference

1. Food processing and nutrition – Bender A.E. – 1978 Academic Press, London.
2. Food processing technology: Principles and Practices. Fellows, P. and Ellis, A.1990,New York.
3. Introduction to food processing – Jelen,P.-1985.Prentice Hall, Reston Virginia, USA.
4. Food Chemistry – Awrand. W. & Woods, A.E.1973.AVI,Westport.

5. Food Chemistry – Meyer, L.H.-1973. East West Press. Ltd, New Delhi.
6. Outlines of Dietary technology –Woarnes.
7. Preservation of fruits and Vegetables – Vijayakhaderkalyani.
8. Preservation of fruits and Vegetables Srivastava, IBD Co. Lucknow.
9. Fish Preservation – S.K. Kulsherestha.
10. Fish Processing and Preservation –C.L.Cutting.
11. Processed Meat- Pearson and Glite – CBS publishes.
12. Poultry, Meat and Egg Products – Parkursht and Mountney.CBS Publishers

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI PART III: CORE ELECTIVE COURSE 6.5B-FOOD AND FOOD PROCESSING TECHNOLOGY															
CO	**COGNITIVE LEVEL**	**PO**							**PSO**						
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	3	1	-	2	1	3	2	2	2	2	2	2	2
CO2	**K-2 Understand**	3	3	3	2	2	2	1	3	2	2	3	2	2	3	2
CO3	**K-3 Apply**	3	3	3	2	2	2	2	3	3	2	3	2	2	3	3
CO4	**K-4 Analyse**	2	3	3	2	2	3	3	3	3	2	3	3	2	3	3
CO5	**K-5 Evaluate**	2	3	3	3	2	3	3	3	3	2	3	3	2	3	3
CO6	**K-6 Create**	2	2	3	2	1	3	3	2	2	2	3	3	-	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Elective Practicals

CORE ELECTIVE PRACTICALS – X
6.5B FOOD AND FOOD PROCESSING TECHNOLOGY

L	T	P	C
--	--	2	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the student to

- determine the nutrient content of the milk and milk products.
- know the procedure for qualitative analysis.
- identify the adulteration of milk.
- acquire knowledge of equipments used in dairy industry.
- enhance the skill to start dairy farm united with milk processing unit.

COURSE OUTCOMES (COs)

On successful completion of the practical course the student will be able to

CO1: adopt the protocols to test the nutrients in milk.

CO2: describe the analytical results**.**

CO3: ingulgate healthy practices.

CO4: start a well equipped dairy/meat/fish/ fruit and vegetable processing unit in their locality.

PRACTICALS

1. Determination of Protein, Starch, Sugar, Amino acids, Crude fibers, Total minerals, Crude fat in food stuff.
2. Estimation of Vitamins – Ascorbic acid, Thiamine.
3. Browning reaction in food, Analysis of lipid- saponification value, acid value & Iodine Value.
4. Determination of Tannins-chemical residues and Aflatoxins, Estimation of Preservative and Antioxidants.
5. Platform test of Milk.
6. Determination of SNF, Specific gravity and total solids of milk.
7. Determination of moisture and fat content of milk powder.
8. Determination of adulterants in milk like Water, Urea, Neutralizes, Preservatives and Starch.
9. Preparation of Channa and Paneer.
10. Preparation of different types of milk products and their evaluations.
11. Preparation of fish, Meat, Egg and Vegetable pickles –Demonstration.
12. Estimation of iron sulphide formation in cooked egg.

13. Visit to a Dairy Unit, Different fruit and vegetables processing unit, Slaughter house and observation of different types of cuts made and demonstration of slaughtering, fish processing unit and submit a report.(Mandatory).
14. Equipments and appliances used in various food processing industries- Observation

COs at Cognitive level and mapping with POs and PSOs

SEMESTER: VI CORE ELECTIVE PRACTICALS: X 6.5B FOOD AND FOOD PROCESSING TECHNOLOGY																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-3 Apply**	3	3	3	2	3	3	2	3	3	2	3	1	1	-	2
CO2	**K-4 Analyse**	3	3	2	2	3	3	2	3	3	2	2	2	2	-	3
CO3	**K-5 Evaluate**	3	3	2	2	2	3	3	3	3	2	2	3	2	2	3
CO4	**K-6 Create**	2	3	2	2	2	3	3	3	3	3	2	3	3	2	3

Strongly Correlated (3); Moderately Correlated (2);Weakly Correlated (1); No Correlation (0).

B.Sc., ZOOLOGY

SEMESTER VI

Core Elective 6.5B Food and Food Processing Technology

Time: 3 Hrs **Max. Marks:75**

PART A (10 X 1 =10 marks)

Answer All Questions

1. The period for which food can be used while maintaining the food quality.
   A)Shelf life B) Quality C) Carrying capacity D) Equilibrium **(CO1) K1**
2. Sensory impressions experienced when consuming foods are called
   A) flavour B) texture C) heat D) colour **(CO1) K1**
3. Method of food preservation in which food is processed and sealed in an airtight container
   A) Canning B) Heating C) Freezing D) Sterilization **(CO2) K2**
4. Process of reducing moisture of food to low levels
   A) Heating B) Cooking C) Dehydration D) Straining **(CO2) K2**
5. Removal of coarse particles from milk is called **(CO3) K1**
   A) Straining B) Filtration C) Clarification D) Cooling
6. Channa is a **(CO3) K1**
   A) milk product B) canned food C) meat D) fruit

7. A process of cutting or shearing fruit is called **(CO4) K1**

A) Sorting B) Blanking C) Grading D) Cleaning

8. Peach is a **(CO4) K1**

A) Vegetable B) Nut C) Fruit D) Tuber

9. Place, where animals are killed, is called **(CO5) K1**

A) Abattoir B) Slaughter house C) Poaching D) Killer

10. Isinglass is a **(CO1) K2**

A) Milk product B) Poultry product C) Fish by-product D) Egg product

PART – B (5 X 5 = 25 Marks)

Answer All Questions choosing either (a) or (b)

11.a) Describe the effects of food processing (OR) **(CO1) K3**

11.b) Write down the importance of enzymes in foods and food industry

12.a) Write a note on storage of foods. (OR) **(CO2) K3**

12.b) Describe minimal and radiation processing

13.a) Describe the factors affecting the composition of milk. (OR) **(CO3) K4**

13.b) Explain the coagulated milk products

14.a) Write down the types of containers used for canned food. (OR) **(CO4) K4**

14.b) Describe the freezing process of fruits and vegetables

15.a) Write down preparatory operations of meat and meat products **(CO5) K3**

(OR)

15.b) Describe the factors affecting the quality of egg and egg products

PART –C (5 X 8= 40 marks)

Answer ALL Questions Choosing either (a) or (b)

16. a) Discuss the functional properties of sugars and polysaccharides OR **(CO1) K5**

16.b) Classify lipids and their uses in foods

17.a) Evaluate the scope and importance of food processing. (OR) **(CO2) K4**

17.b) Describe the methods of food preservation.

18.a) Explain the methods of processing of milk. (OR) **(CO3) K3**

18.b) Describe the types and factors affecting the quality of condensed milk.

19.a) Assess the various techniques of thermal processing of fruits. (OR) **(CO4) K5**

19.b) Discuss the equipment and process for dehydration of vegetables

20.a) Briefly explain the post-mortem inspection and changes during the slaughter of meat animals. (OR) **(CO5) K3**

20.b) Write an essay on fish and fish products

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MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Elective

CORE ELECTIVE COURSE (GROUP B)
6.5C POULTRY SCIENCE

L	T	P	C
4	--	--	4

LEARNING OBJECTIVES (LOs)

The objectives of the course are enabling the student to

- study the scope and importance of Poultry for the betterment of human livelihood.
- introduce on poultry housing, and various commercial breeds of layers and broilers.
- get deep knowledge on poultry management and vaccination schedule.
- know about poultry nutrition, deficiency symptoms, and feed formulation.
- study the causes, symptoms, transmission, treatment, and control of diseas

COURSE OUTCOMES (COs):

On successful completion of the course the student will be able to

CO1: understand the concepts of chicken breeds and principles of poultry housing.

CO2: gain knowledge on brooding equipments and management of chicken.

CO3. understand poultry nutrition, need formulation and deficiency symptoms

CO4. analyse poultry diseases, Causes, Symptoms, Transmission, Treatment, and Control

CO5: identify, prevent and treat various endoparasites and ectoparasites.

CO6: promote poultry housing and confidence to mange a farm and become a successful entrepreneur.

UNIT I
POULTRY HOUSING

Scope of Poultry industry in India – Role of egg in human nutrition. Choosing commercial layers and broilers –sexing in one-day old chicks. Poultry housing: general principles of construction of poultry house. Deep litter system – Feeders and Waterers. Cage rearing: Californian cages.
(12L)

UNIT II
POULTRY MANAGEMENT

Rearing of Layer and Broiler chicks – brooding and brooding equipment. Management of Growers, Layers and Broilers. Management of cage birds. Lighting for growers and layers. Summer and winter management. Debeaking – Forced moulting – Poultry manure - Vaccination schedule.
(12L)

UNIT III
POULTRY NUTRITION

Energy metabolism –energy requirements –carbohydrates, protein, amino acids and fat requirements for Chicks, Growers, Layers and Broilers. Symptoms and signs of deficiency: Fibre requirement, requirements of vitamins and essential inorganic minerals – mineral mixture – Deficiency symptoms – non-nutritive feed additives -Feed formulation.
(12L)

UNIT IV
POULTRY DISEASES

Causes, Symptoms, Transmission, Treatment and Control of the following diseases. Viral disease: Ranikhet disease, Fowl pox, Infectious bronchitis and Gumboro disease. Bacterial disease: Salmonellosis, Fowl typhoid, Pullorum, Fowl cholera, Coryza, Botulism and Mycoplasmosis. Fungal diseases: Aspergillosis and Aflatoxicosis.
(12L)

UNIT V
PARASITIC DISEASES

Coccidiosis- Nematode infections- round worms - tape worm - caecal worms – capillary worms – infections. Prevention and treatments by deworming. External parasites of chicks: ticks, mites and lice.
(12L)

(TOTAL 60L)

Books for reference

1. Gnanamani MR, Modern aspects of commercial poultry keeping, 2010, Deepam Publications, Madurai.
2. Vegad, J. L. Poultry diseases: a guide for farmers & poultry professionals. 2nd edition, CBS publishers.
3. Chauhan HVS & S Roy,2018, Poultry diseases, Diagnosis and Treatments, New Age International publishers.
4. Ghosh, N. 2015. Poultry Science and Practice: A textbook.1st edition. CBS publishers and distributors.
5. Newman Tom. 1999. Principles and practices of poultry husbandry. 2ndedition, IBDC publishers.
6. Sreenivasaiah, P. V. 2006. Scientific poultry production: a unique encyclopaedia. International book distributing Co.
7. Sreenivasaiah, P. V. 2015. Textbook of Poultry Science. Write and print publications.
8. Poultry farm manual: A reference guide for Central and State Poultry Farms, 2014-15.www.dadf.gov.in and www.dadh.nic.in.

COs at Cognitive level and mapping with POs and PSOs

SEMESTER VI PART III: CORE ELECTIVE COURSE: 6.5C- POULTRY SCIENCE																
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	3	2	3	3	3	3	3	3	3	1	2	3	3
CO2	**K-2 Understand**	3	3	3	2	3	3	3	3	3	3	3	1	2	3	3
CO3	**K-3 Apply**	3	3	3	2	3	3	3	3	3	3	3	1	2	3	3
CO4	**K-4 Analyse**	3	3	3	2	3	3	3	3	3	3	3	1	2	3	3
CO5	**K-5 Evaluate**	3	3	3	2	3	3	3	3	3	3	3	1	2	3	3
CO6	**K-6 Create**	2	3	3	2	2	3	3	3	3	3	-	1	2	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0).

MSU/2021-22/UG-Colleges/Part-III (B.Sc. ZOOLOGY) SEMESTER -VI /Core Elective Practical

CORE ELECTIVE PRACTICAL- X
6.5C POULTRY SCIENCE

L	T	P	C
--	--	2	1

LEARNING OBJECTIVES (LOs)

The objectives of the practical course are enabling the student to

- know the different types of poultry breeds and their management.
- gain knowledge on vaccination schedule.
- understand proper disease management.
- get an awareness about keeping a poultry farm.

COURSE OUTCOMES (COs)

On successful completion of the practical course the student will be able to

CO1: remember the types of poultry breeds and its management strategies.

CO2: practice proper vaccination schedule.

CO3: adopt novel and healthy method of feeding and watering procedure.

CO4: analyse the causes of diseases and methods of treatment.

CO5: decide to start a poultry farm in their locality.

PRACTICALS

1. Identification of common breeds of chicken.
2. Poultry housing - Cage house Model.
3. Incubation – collection and storage of eggs – incubation period – hatching - sexing
4. Vaccination and medication programme.
5. Feeders and Waterers.
6. Culling of layers.
7. Identification of Ectoparasites.
8. Identification of Endoparasites.
9. Ranikhet disease, Fowl pox, Coryza, Coccidiosis - Diagrams or models..
10. Debeaking, deworming and delicing
11. Internship or Visit to a poultry farm and reporting. (Mandatory)

COs at Cognitive level and mapping with POs and PSOs

	SEMESTER VI PART III: CORE ELECTIVE PRACTICAL X: 6.5C- POULTRY SCIENCE															
CO	**COGNITIVE LEVEL**	**PO**							**PSO**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
CO1	**K-1 Remember**	3	3	3	2	3	2	-	3	3	3	3	1	1	-	2
CO2	**K-2 Understand**	3	3	3	2	3	3	1	3	3	3	3	1	1	2	3
CO3	**K-3 Apply**	3	3	3	2	3	3	3	3	3	3	3	1	1	3	3
CO4	**K-4 Analyse**	3	3	3	2	3	3	3	3	3	3	3	1	-	3	3
CO5	**K-5 Evaluate**	3	3	3	2	3	3	3	3	3	3	3	1	-	3	3
CO6	**K-6 Create**	2	3	3	2	2	3	3	3	3	3	2	1	2	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0).

MODEL QUESTION PAPER

B.Sc., ZOOLOGY

SEMESTER VI

Core Elective 6.5C POULTRY SCIENCE

Time: 3 hrs **Max. Marks: 75**

PART A (10X1=10) **Choose the correct answer** **Mapping level**

1. Incubation period of hen's egg is **(CO1) K1**

   a)16 days b) 21 days c) 24 days d) 32 days

2. The poultry house should be located at direction **(CO1) K2**

   a) East-West b) North-South c) West-North d) South-East

3. One egg has ____ calories **(CO2) K1**

   a) 55 b) 65 c) 75 d) 100

4. Debeaking is done especially on **(CO2) K2**

a). Chicks b) Layers c) Growers d) Broilers

5. In poultries, _____ % of protein is required as starter feed for broiler **(CO3) K1**

a) 22% b) 33% c) 44% d) 55%

6. ____ is essential for growth and egg shell formation . **(CO3) K1**

a)Vitamin D3 b) Vitamin B2 c) Vitamin K4 d) Vitamin B12

7. Which of the following is added as additives to prevent disease? **(CO4) K2**

a) Antibodies b) Anticoagulants c) Antigens d) Antioxidants

8. Perosis is due to the deficiency of **(CO4) K1**

a) Vitamin D3 b) Vitamin B2 c) Vitamin K4 d) Vitamin B12

9. Fowl pox is a _____ disease **(CO5) K1**

a). Bacterial b) Viral c) Fungal d) Nematodal

10. External parasite of chick is _____ **(CO5) K1**

a) Pin worm b) Tape worm c) Tick d) Argula

PART – B (5 x 5 = 25marks)

Answer either a or b not exceeding 250 words

a) Write short notes on nest boxes. (or) **(CO1) K3**

11

b)Write an account on Vaccination of chicks. 12

a) Elaborate the management of chicks.(or) **(CO2) K4**

b) Write short notes on debeaking.

13. a) Discus the fat requirement for chicks. (Or) **(CO3) K4**

b) Explain the symptoms of excessive dietary levels.

14.a) Mention the importance of feed additives. (Or) **(CO4) K4**

b) Explain the role of fiber content in poultry feed.

15.a) Write notes on food typhoid (Or) **(CO5) K3**

b) Comment on Aspergillosis

PART C (5X8= 40 Marks)

Answer either (a) or (b) not exceeding 600 words

16. a) Discuss the advantages of deep litter system for pfofitable poultry. (Or) **CO1** **K4**

b). Explain the methodology of forced moulting in poultry.

17.a) Explain the composition and values of poultry manure. (Or) **(CO2)** **K3**

b) Write an account on summer and winter management in poultry.

18.a) Write an essay on Poultry nutrition. (Or) **(CO3)** **K3**

b) Write a detailed note on deficiency disorder.

19. a) How will you prepare a balanced supplementary feed? (Or) **(CO4)** **K4**

b). Discuss the biological importance of proteins in poultry.

20.a) Discuss fowl cholera and coryza. (Or) **(CO5)** **K4**

b) What are external parasites of chick? Give two examples.