

UNIVERSITY OF CALICUT

B.Sc. ZOOLOGY PROGRAMME

SYLLABUS

CORE COURSES

COMPLEMENTARY COURSES

&

OPEN AND ELECTIVE COURSES

With effect from 2013-14 admission

MODEL QUESTION PAPERS

**INTRODUCTION, GUIDELINES
AND
GENERAL INFORMATION**

INTRODUCTION

The Programme of Higher Education in Kerala is about to witness a drastic change from 2009-'10 admission onwards with the introduction of Semesterisation and Grading at the undergraduate level. The system is being implemented under the direction of Kerala State Higher Education Council (KSHEC) which has worked out the policy after a number of deliberations and consultations with experts in the field of education and Chairpersons of Boards of Studies (BOS) of all universities in Kerala. The KSHEC directed all BOS to conduct five-day workshops to frame curricula and draft syllabi to suit the semester system for which financial assistance was sanctioned to each BOS. Accordingly, the BOS in Zoology (U. G.) requested all colleges affiliated to the University of Calicut, which offer Zoology as a Degree Programme, to depute at least one faculty member to attend the five-day workshop organized in the Senate Hall, University of Calicut from 19.01.2009 to 23.01.2009. A total of 30 faculty members from various colleges participated in the workshop and contributed their share in drafting the curriculum and syllabus. The workshop was inaugurated by Prof. Anwar Jehan Suberi, the Hon'ble Vice-Chancellor of the University, on 19.01.2009. In his valedictory address on 23.01.2009, Dr. C. Gopinathan Pillai, the Hon'ble Pro-Vice-Chancellor of the University, emphasized the need for change in the existing pattern of UG curriculum.

2013-2014 FIRST SEMESTER ADMISSION ONWARDS

After the implementation of the new CCSS syllabi w.e.f.2009 the Board of studies in Zoology(UG) have received many requests and suggestions regarding the content.The BoS on assuming charge discussed the matter in detail and decided to make necessary changes and modifications in order to revise the syllabi.Accordingly the BoS meetings held on 29.06.2010 and 17.06.2011 took decision to make necessary modifications and to **implement the revised syllabus w.e.f 2013-2014 B.Sc UG admission.**

Ref:No GA IV/JI/4279/10/ dated 01.06.2011,Registrar,University of Calicut.

Ref:No GA IV/JI/4903/10 dated 10.01.2012, “

Ref:No 3129/GA-IV-J1/2013/CU dated 17.02.2013 “

A Semester will be of 90 days duration including end-semester exam with a total of 450 contact hours for instruction. The total number of credits required for the programme is fixed at 68. The total number of courses for the programme will be 34. The break up is as follows:

- | | | |
|----|-------------------------|------|
| 1. | Common Course | : 10 |
| 2. | Core Course | : 14 |
| 3. | I Complementary Course | : 4 |
| | II Complementary Course | : 4 |
| 4. | Open Course | : 2 |

SCHEME OF INSTRUCTION

For B. Sc. Zoology programme, Zoology forms the core course. It is to be taught during all the six semesters. Both theory and relevant practical components are included for study during the six semesters (Table I).

A. Theory

The total number of core theory courses is fourteen, one course each during the first four semesters, and five core courses each during the fifth and sixth semesters. The theory core course I (code: ZO1B01) prescribed for the first semester and core course II (code: ZO2B03) for the second semester are of 36 hours in syllabus (2 hours/ week) with 2 credits each. The theory core course III (code: ZO3B05) for third semester and core course IV (code ZO4B07) for fourth semester are of 54 hrs (3 hours/ week) with 3 credits each. Core course V (code: ZO5B 09), VI code .ZO5B 10, VII code. ZO5B 12, VIII code: ZO6B14 of fifth semester are of 54 hrs (3 hours/ week) with 3 credits each. Core course theory IX code: ZO6B16, X.code: ZO6B18, XI code ZO6B 19,XII.code ZO6B 21 of sixth semester are also of 54 hours in syllabus (3 hours/ week) with 3 credits each.

In the fifth semester, under **open course** three courses are prescribed for students from other streams. An institution can choose any one of the following:

Open Course : 01. Reproductive Health and Sex Education
 02. Nutrition, Health and Hygiene
 03. Applied Zoology

Towards achieving vocationalisation, three topics are prescribed under **Elective Course** for sixth semester Zoology core students. An Institution can choose any one of the following:

Elective Course : 1. Human Genetics
 2. Aquaculture, Animal Husbandry and Poultry
 3. Applied Entomology

The syllabus for the B. Sc. degree programme with Zoology as core subject of study has provision for both theory and practical components in all the six semesters. In addition to the end-semester examinations to be conducted by the University, a system of continuous evaluation through **Internal Assessment** by the faculty members of the Department of Zoology of the respective institutions must be adopted for Zoology core courses. The assessment of students involves 75% for External Evaluation and 25% for Internal Assessment. Examinations for theory courses will be held at the end of each semester. Examination for the practicals for the first four semesters will be held at the end of the fourth semester and those of fifth and sixth semesters at the end of the sixth semester. Practical courses offered are designed to support the theory topics and also to impart basic skills and techniques required of them.

For developing the learning and understanding skill of students, some pertinent topics are suggested for Seminar / Assignment / Group discussion / Self study.

The present system of assessing the students by awarding marks is discarded and a method of grading on a five-point scale is adopted which is as follows:

Grade	Grade points	Grade Point Average Range
A	4	3.5 to 4
B	3	2.5 to 3.49
C	2	1.5 to 2.49
D	1	0.5 to 1.49
E	0	Less than 0.5

B. Practical

Practicals corresponding to each core course will be conducted during the corresponding semesters. A combined examination relating to the first four core courses I,II,III and IV will be held at the end of fourth semester and that will be designated as Practical I (2 hours/ week) with 144 hours and a total credit of 8. Practicals related to core courses V,VI,VII and VIII form Practical II (8 hours/ week) with 144 hours/ semester and Practicals related to core courses IX,X, XI,XII, and [Elective ZO6B24(P) 01/02/03] form Practical III(8 hours/ week) with 144 hours/semester duration. Credit for Practical II and III is 8 each and examination will be conducted at the end of the sixth semester.

Any candidate, who turns up for a practical examination, must submit a certified bonafide record / report of work done by him/ her duly attested by the teacher in charge and the Head of the Department at the time of practical examinations. **All practical examinations are of three and half hours duration.**

C. Project [Code : ZO6B25 (Pr)]

A project work forms an integral part of the curriculum during the fifth and sixth semesters. Project works extend over the fifth and sixth semesters (2 hours/ week). Topics related to any of the theory courses can be selected. Not more than **12 students** can form a group and undertake a project. Each individual student should submit a copy of the project report duly attested by the supervising teacher and the Head of the Department

D. Study Tour.

Field trips / Study tour to places of biological interest, of not less than five days, are also compulsory elements of the curriculum. Students are required to visit different ecological sites for observing animals in their natural habitats. Out of the five days one day must be for tour related Elective subject and one day for visit to a site of ecological importance. They shall also visit Institutes / Museums / Zoos, etc. for collecting additional biological information.

E. Internal Assessment

The process of Internal Assessment must be transparent. There shall not be any chance for **favouritism, victimization, discrimination** or whatsoever. To avoid unpleasant situations being created, the following precautions may be taken.

1. Assignments and answer scripts of class tests are **to be returned after evaluation**. Grievances, if any, may be redressed forthwith. Then the papers may be collected and kept in the Department for further reference.
2. Tabulated statement of internal evaluation put **must be up on the department notice board prior to despatch** to the University towards the end of each semester.
3. A grievance redressal committee may be constituted at the Department level to supervise re-tests, seminars, evaluation of assignments etc.
4. Each student has the right to appeal against any injustice in the internal assessment / evaluation. This can be raised at three levels.
 - a) He/ She may appeal against the injustice to the teacher concerned.
 - b) If not satisfied, he/ she may plead to the Head of the Department, who will then discuss the case with all faculty members of the Department and come to a conclusion.
 - c) If the candidate again feels that justice has not been served at this level too, he/ she may bring the matter before the Principal for a final

hearing. The Principal will constitute a committee consisting of two members of the college council (nominated by the Principal), Head of the Department of Zoology, and the Principal himself / herself. The decision taken by the committee shall be final and binding. Model tabulation sheets for internal assessment score (theory and practical papers) are appended herewith.

SCHEME OF EVALUATION

The performance of a student in the course / programme is to be assessed in terms of grades. Evaluation is conducted through (I) Continuous Internal Assessment and (II) End-Semester External Examination. Internal Assessment fetches 25% and External Examination 75%. Weightage of a course is 30. Weightage for internal assessment is 5 and for external evaluation 25 for both theory and practical (Table II).

1. Continuous evaluation through Internal Assessment = 25%; Weightage: 5

Internal Assessment will be a continuous process. It will be done by faculty members of the department of Zoology of the institution where the candidate is pursuing the study. It will be based on the student's attendance, performance in class tests, term examination, seminars, group discussions and submission of assignments, records and reports. Students will be graded on a five-point scale which provides sufficient space for differentiation and categorization.

A. Theory: 25%; Weightage: 5

Criteria for Internal Assessment:

Sl. No.	Parameter	% of Internal Assessment	Weightage
(a)	Attendance	5%	1
(b)	Class tests (2 Nos.)	10%	2
(c)	Seminar	5%	1
(d)	Assignment	5%	1
Total		25%	5

(a) Attendance

90% and above	5%	A Grade
80% to 89%	4%	B Grade
75% to 79%	3%	C Grade

But a student with below 75% attendance cannot appear for the examination.

(b) Class Tests

Two class tests must be conducted during the semester for each course, each test with 5% of the internal assessment. Questions of the class test can be objective type, short answer, short essay or long essay and graded on a five-point scale. For short essays and long essays the following pattern of grading is to be followed.

<u>Nature of Answer</u>	<u>Grade</u>	<u>Grade point</u>
Excellent	A	4
Very good	B	3
Good	C	2
Average	D	1
Poor	E	0

(c) Seminar

It is to be graded based on the timely presentation, way of presentation, matter content, etc. Taking into account all these factors students can be graded on the five-point scale as given in (b) above.

(d) Assignment

It is to be graded based on timely submission, content, etc. on the five-point scale as given in (b) above.

B. Practical: 25%; Weightage: 5

Criteria for internal assessment

Sl. No.	Parameter	% of Internal Assessment	Weightage
(a)	Attendance	5%	1
(b)	Punctuality, Performance, etc.	5%	1
(c)	Class test (2 Nos.)	5% for each test - Total : 10%	2
(d)	Record	5%	1
	Total	25%	5

- (a) **Attendance:** Same as given for theory (a) above
- (b) **Punctuality, performance in lab, etc.:** Grade the students in the five-point scale as given for theory (b) above.
- (c) **Class test:** Two class tests must be conducted for a practical course during a semester, each with 5% of internal assessment.
- (d) **Record** is to be assessed taking into account the following points:– timely presentation, neatness and contents and is to be graded on the five-point scale as given for theory (b) above.

Internal Assessment Grade – Theory: Weightage = 5

Criteria	Grade	Grade Point	Weightage	Weighted Grade Point
Attendance			1	
Class test			2	
Seminar			1	
Assignment			1	
Total			5	

Internal Assessment Grade – Practical: Weightage = 5

Criteria	Grade	Grade Point	Weightage	Weighted Grade Point
Attendance			1	
Punctuality, Performance, etc.			1	
Class test			2	
Record			1	
Total			5	

(c) Project, Study tour, Viva: Weightage: 5

Criteria for Internal Assessment

<u>Item</u>	<u>Weightage</u>
Project	3
Study tour	1
Viva Voce	1
Total	<hr/> 5

A student shall be assessed for the above three requirements according to the five point scale. Follow the criterion for theory (b) above.

Internal Assessment Grade: Project / Study tour / Viva-Voce

Crtieria	Grade	Grade Point	Weightage	Weighted Grade Point
Project			3	
Study tour			1	
Viva-Voce			1	
Total			5	

UNIVERSITY OF CALICUT
Tabulation Sheet for Internal Assessment Score
B. Sc. Zoology: Theory course No.....

Name of College :

Name and Code No. of Course :

Month, Year and Semester of Examination:

Sl. No.	Register No.	Name of Candidate	Weighted Grade Point for				Total Weighted Grade Points	Grade (Total weighted grade point / Sum of weightage)	Remarks	
			Attendance	Class Test		Seminar				Assignment
				1	2					
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Name and Signature of Teacher in Charge

Date:

Head of the Dept. of Zoology

Principal

UNIVERSITY OF CALICUT
Tabulation Sheet for Internal Assessment Score
B. Sc. Zoology: Practical course No.....

Name of College :
 Name and Code No. of Course :
 Month, Year and Semester of Examination :

Sl. No.	Reg. No.	Name of Candidate	Weighted Grade Points for				Total Weighted Grade Points	Grade (Total weighted Grade Points/ Total weightage)	Remarks	
			Attendance	Performance	Class Test					Record
					1	2				
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Name and Signature of Teacher in Charge

Date:

Head of the Dept. of Zoology

Principal

II. End Semester External Examination (Conducted by the University)

A. Theory:

One core course each at the end of the first four semesters, four core courses and one Open Course at the end of the fifth semester, and four core courses and One elective Course at the end of sixth semester. Question papers for the conduct of theory examinations shall be set by paper setters appointed by the University, preferably from outside. **Set question papers in proportion to the hours allotted to each section of that particular course.** Answer scripts shall be valued by External Examiners from within the University. The duration of examination is 3 hours per course. External examinations contribute 75% of the grade with a weightage of 25 for each course. Each course will be graded according to the five point scale. Table III illustrates the scheme of question paper along with weightage.

B. Practical:

Practicals related to core courses I to IV of the first four semesters form core course Practical I. This Practical examination will be held at the end of the fourth semester. Core course Practical II (related to Core courses V,VI,VII, & VIII) and Practical III (related to Core courses IX, X, XI, XII and elective) examinations will be held at the end of the sixth semester. The question papers for the conduct of practical examination shall be prepared by the Board of External Examiners appointed by the University. Practical examination is to be conducted by a team of two examiners – one external and one internal. **The duration of the examination is 3 hours and 30 minutes per course and conduct only one examination a day.** For each practical course, students will be graded according to the five point scale. Weightage for practical is 25. Table IV illustrates the scheme of question paper along with weightage.

A batch may contain a maximum of 12 candidates per session .

C. Record

A few changes have been incorporated in the preparation of records. Hand-drawn sketches of whole animals (both macroscopic and microscopic) are compulsory for the Core course Practical I (Nonchordata and Chordata). The record should contain the scientific name, phylum and class, (for vertebrates order also) of the specimens with notes on identifying features and zoological importance, if any. Diagrams of type animals which are dissected must also be drawn to show morphology. Hand-drawn sketches of dissections, mountings and sections also must be given.

Records related to the practicals I, II and III shall be evaluated by the examiners on the respective days of practical examination according to the five point scale.

Project: Credit 4; External Weightage: 25

Project Report	15
Study tour report	5 (Zoological, Ecological, Elective (1 day))
Viva	5
	<hr/>
Total	25

Reports related to project work and study tour should be evaluated by the examiners on the next day after Practical III, at the end of sixth semester. Maximum time for assessing a student is ten minutes.

Viva-Voce

Viva-Voce will be based mainly on the project work. Questions on basic and general biological topics can also be asked. Viva-Voce is to test the students' capacity for expressing the ideas clearly and effectively, **without causing frustration or fear in the student.**

1TABLE I

SCHEME OF INSTRUCTION

B. Sc. Zoology (Core): w. e. f. 2013 admission

Semester	Core Course / Open Course	Code	Course Content	Instructional hours/ week	Instructional hours in a semester	Credit
I	Theory I	ZO1B01T	Animal Diversity – Nonchordata.Part-I	2	36	2
	Practical- I*A	ZO1B02(P)	Practical related to theory core course ZO1B01	2	36	2
II	Theory II	ZO2B03T	Animal Diversity – Nonchordata.Part-II	2	36	2
	Practical- I*B	ZO2B04(P)	Practical related to theory core course ZO2B03	2	36	2
III	Theory III	ZO3B05T	Animal Diversity – Chordata.Part-I	3	54	3
	Practical- I*C	ZO3B06(P)	Practical related to theory core course ZO3B05	2	36	2
IV	Theory IV	ZO4B07T	Animal Diversity I – Chordata.Part-II	3	54	3
	Practical- I*D	ZO4B08(P)	Practical related to theory corecourse ZO4B07	2	36	2
V	Theory V	ZO5B09T	Enviornmental Biology, Wild Life Conservation and Toxicology	3	54	3
	Theory VI	ZO5B10T	Ethology, Evolution and Zoogeography	3	54	3
	Practical-II* A	ZO5B11(P)	Practical related to theory core course ZO5B 9&10	3	54	3
	Theory VII	ZO5B12T	Cell Biology& Genetics	3	54	3
	Practical-II*B	ZO5B 13(P)	Practical related to theory core course ZO5B 12	3	54	3

Semester	Core Course / Open Course	Code	Course Content	Instructional hours/ week	Instructional hours in a semester	Credit
	Theory VIII	ZO 5B 14T	General Methodology in Science, Biostatistics and Informatics	3	54	3
	Practical-II*C	ZO 5B 15(P)	Practical related to theory core course ZO5B 14	2	36	2
	Open Course I (For other streams)	ZO5D01T/02T/ 03T	01T-Reproductive Health & Sex Education / 02T-Nutrition, Health & Hygiene /03T- Applied Zoology (Any one)	3	54	3
			Project work / Field visit / Study tour	2	36	2
VI	Theory IX	ZO 6B 16T	Biochemistry, Physiology and Endocrinology	3	54	3
	Practical-III*A	ZO 6B 17(P)	Practical related to theory core course ZO5B 16	2	36	2
	Theory X	ZO 6B 18T	Molecular Biology, Bioinformatics	3	54	3
	Theory XI	ZO6B 19T	Reproductive Biology, Developmental Biology & Teratology	3	54	3
	Practical-III*B	ZO6B 20(P)	Practical related to theory core course ZO6B 19	2	36	2
	Theory XII	ZO6B 21T	Biotechnology, Microbiology & Immunology	3	54	3
	Practical-III*C	ZO6B 22(P)	Practical related to theory core course ZO6B 21	2	36	2
	Elective Course	ZO6B 23(E) 01/02/03	01-Human Genetics /02- Aquaculture, Animal Husbandry & Poultry / 03-Applied Entomology (Any one)	3	54	3
	Practical- III*D	ZO6B 24(P)	Practical related to theory elective course ZO6B 23(E)	2	36	2

Semester	Core Course / Open Course	Code	Course Content	Instructional hours/ week	Instructional hours in a semester	Credit
		ZO6B 25(Pr)	Project work / Field visit / Study tour**	2	36	2
IV	Practical-I	IA,IB,IC&ID*	ZO1B 02,04,06&08	8	144	8
VI	Practical-II	IIA,IIB&IIC*	ZO5B 11,13&15	8	144	8
VI	Practical-III	IIIA,IIIB,IIIC&IIID*	ZO6B 17,,20,22&24	8	144	8

* For Zoology Core Courses. No external practical examination at the end of I, II, III & V Semesters. Practical Examination I will be a composite one comprising ZO1B02(P), ZO2B04(P), ZO3B06(P) & ZO4B08(P) at the end of Semester IV. Practical Examination II will include ZO5B11(P),ZO5B13 & ZO5B15P) and will be at the end of Semester VI. Practical III will include ZO6B17(P),ZO6B20(P),ZO6B22(P),ZO6B23(E) at the end of Semester VI. ZO6B25(Project) evaluation on the next day.

**External evaluation for Project Report and Field study Report will be conducted at the end of Semester VI on the next day after Practical III along with a viva-voce.

TABLE II
SCHEME OF EVALUATI

B. Sc. Zoology (Core) w. e. f. 2013 admission

Semester	Core Course Code	Name of Course	Theory		Practical		Weightage for internal assessment	Weightage for external exam	Duration of University examination
			Internal assessment	External Evaluation	Internal assessment	External Evaluation			
I	ZO1B01T	Animal Diversity – Nonchordata.Part-I	25%	75%			5	25	3. hrs
II	ZO2B03T	Animal Diversity - Nonchordata.Part-II	25%	75%			5	25	3. hrs
III	ZO3B05T	Animal Diversity – Chordata.Part-I	25%	75%			5	25	3. hrs
IV	ZO4B07T	Animal Diversity – Chordata.Part-II	25%	75%			5	25	3. hrs
	Core Prctical- I	ZO1B02(P)+ZO2B04(P)+ZO3B06(P)+ZO4B08(P)			25%	75%	5	25	3.5 hrs
V	ZO5B09T	Enviornmental Biology, Wild Life Conservation and Toxicology	25%	75%			5	25	3 hrs
	ZO5B10T	Etholog ,Evolution and Zoogeography	25%	75%			5	25	3 hrs
	ZO5B12T	Cell Biology and Genetics	25%	75%			5	25	3 hrs
	ZO5B14T	GeneralMethedology in Science, Biostatistics and Informatics	25%	75%			5	25	3 hrs
	ZO5DO1,2,3	Open Course I	25%	75%			5	25	3 hrs
VI	ZO6B16T	Biochemistry,Physiology and Endocrinology	25%	75%			5	25	3 hrs
	ZO6B18T	Molecular Biology and Bioinformatics	25%	75%			5	25	3hrs

Semester	Core Course Code	Name of Course	Theory		Practical		Weightage for internal assessment	Weightage for external exam	Duration of University examination
			Internal assessment	External Evaluation	Internal assessment	External Evaluation			
	ZO6B19T	Reproductive Biology, Developmental Biology & Teratology	25%	75%			5	25	3 hrs
	ZO6B21T	Biotechnology, Microbiology and Immunology	25%	75%			5	25	3 hrs
	ZO6B23(E)	Elective Course 01/02/03	25%	75%			5	25	3 hrs
	Core Practical II	ZO5B 11(P)+ZO5B 13(P)+ZO 5B 15(P)			25%	75%	5	25	3.5 hrs
	Core Practical III	ZO5B17(P)+ZO6B 20(P)+ZO6B22(p) ZO6B 24(P)			25%	75%	5	25	3.5 hrs
	ZO6B 25(Pr) project	Project report, Study tour report, Viva-Voce.			25%	75%	5	25	10 minutes for a student; on the next day for all candidates of the centre after Practical III

TABLE III**THEORY: SCHEME OF QUESTION PAPER WITH SCORE/ WEIGHTAGE
EXTERNAL**

Type of Questions	Question No.	Nature of questions	Weightage
I. Objective (in bunches of four)	1 – 4	Multiple choice	1
	5 – 8	Match the following	1
	9 – 12	True or False	1
	13 – 16	Fill in the blanks	1
	17 – 20	One word (Direct)	1
II. Short Answer	21	Direct	1
	22	Indirect	1
	23	Understanding	1
	24	Reasoning	1
	25	Sketch and label	1
	26	Problematic / Finding solution	1
III. Short Essay	27		2
	28		2
	29		2
IV. Long Essay	30		4
	31		4
		TOTAL	25

TABLE IV**PRACTICAL: SCHEME OF QUESTION PAPER WITH SCORE/ WEIGHTAGE
EXTERNAL**

Type of Questions	Question No.	Nature of questions	Weightage
I. Objective (a bunch of 4 questions)	1 – 4	Scientific name (1) habit / habitat/ peculiarity (2) Importance/ significance (3) Use / Application	3
II. Short Answer	5	Sketch and label / identify giving reason etc.	2
III. Minor Experiment / Dissection	6		5
IV. Major experiment / dissection	7		10
V. Record			5
		TOTAL	25

APPENDIX I

List of the members of Board of Studies in Zoology (U. G.)

N0.GA 1/F2/302/2010 dated 30.03.2010,Calicut University.P.O

Sl. No.	Name	Designation	College
1	Sri.M.P.Sethumadhavan	Associate Professor [Chairman], BOS	Govt: Victoria College, Palakkad
2	Dr. P. K.Sumodan	Assistant professor, Member, BOS	Govt: College, Madappally
3	Dr. Vyjayanthi	Associate professor, Member, BOS	Providance Womens College, Kozhikode
4	Dr. P. Haridasan	Associate professor, Member, BOS	Sree Neelakanta Govt. Sanskrit College, Pattambi
5	Sri.Tomy Francis	Associate professor Member,BOS	St:Aloysius College,El-thuruth
6	Sri. Basheer Ahamed. P.	Associate Professor Member, BOS	P.S.M.O College,Tirurangadi
7	Dr. B.Hari.	Assistant Professor, Member, BOS	S.N College, Nattika
8	Dr. Lambert Kishore.	Associate Professor, Member, BOS	Malabar Christian College, Calicut
9	Dr.C.Vimala	Associate professor, Member, BOS	S.N.College,Nattika
10	Dr. C.V.Sreeranjitkumar	Assistant Professor, Member, BOS	Govt: Victoria college , Plakkad
11	Dr.K.P.Janardhanan	Professor,University of Calicut,Chairman P.G, BoS	Universsity of Calicut Dept of Zoology

SYLLABUS
CORE COURSES 1 TO 24
&
OPEN COURSES 1,2&3
ELECTIVE COURSES 1,2&3

FIRST SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

ZOOLOGY CORE COURSE- I

ANIMAL DIVERSITY : NONCHORDATA PART- I

Code: ZO5B 01T

[DIVERSITY, ADAPTATIONS AND FUNCTIONAL ANATOMY OF
PROTOZOANS AND NONCHORDATES)

[36 hours] [2 hours per week] [2 Credits]

Section-A (10 hrs)

I. Principles of classification and nomenclature (5 hrs)

Systematics; Natural and classical. Nomenclature: Binomial and Trinomial nomenclature; International rules of Zoological nomenclature (brief account); Mention new trends in systematics like Chemotaxonomy and Serotaxonomy, Cytotaxonomy, Numerical taxonomy (Phenetics), Cladistics (Phylogenetic systematics), Molecular systematics.

(1hr)

II. Five kingdom classification of living organisms. Mention Cavaller-smith, s eight kingdom classification also. (1 hr)

III. Concepts of classification of animals (brief account) (4 hrs)

Classification based on number of cells, tissue or organ system level of organisation, development of germ layers, development of symmetry , development of coelom, segmentation in the somite, homology and analogy of organs and their origin, development of mouth and digestive tract.

Section-B

KINGDOM PROTISTA (6 hrs)

(Give a comparative account of various functional systems of the types specified to get an idea on the evolutionary trends of diversity.)

Type: *Paramecium*: morphology and structural organization [as revealed by compound microscopy]; locomotion, nutrition, excretion, osmoregulation and reproduction; conjugation in detail.

Characteristic features and classification of Kingdom Protista down to phyla
[Salient features of the following phyla with note on the examples cited]

Phylum Rhizopoda. Eg: *Amoeba*

Phylum. Dinoflagellata. *Noctiluca*

Phylum. Parabasalia. *Trichonympha*

Phylum Apicomplexa [=Sporozoa] eg: *Plasmodium*

Phylum Ciliophora eg: *Vorticella*, *Ephelota*

Section- C

KINGDOM ANIMALIA

(20 hours)

Salient features of the Major Phyla of animals and their diversity

[*Habits, habitat, morphology, functional anatomy and life history of representative types (wherever specified) and classification of each phylum down to classes, except otherwise mentioned, and examples thereof:*

Study of animal diversity with typical examples from each class, with emphasis on ecological and adaptive features, economic importance and such other points of biological interest expected. Only very brief account of each example is to be studied.]

Compare the various systems based on a specific example from each phylum

(1 hr)

MESOZOA

A brief account of dicyemid and orthonectid mesozoans with examples:
Dicyema, *Rhopalura*

METAZOA

Phylum **PORIFERA**

(3 hrs)

Classification down to classes; salient features of the classes

Class Calcispongiae example: *Leucosolenia*

Class Demospongiae example: *Spongilla*

Class Hyalospongiae example: *Euplectella*

Give an account of canal system; mention amphiblastula, parenchymula and gemmule

Phylum **CNIDARIA [=COELENTERATA]**

(7 hrs)

Type: *Obelia* morphology and life cycle

Classification down to classes; salient features of the classes

Class Anthozoa example: *Adamsia*, *Zoanthus*, and *Madrepora*

Class Hydrozoa example: *Halistemma*, *Physalia*

Class Scyphozoa example: *Rhizostoma*

Phylum **CTENOPHORA [=ACNIDARIA]**

(1 hr)

Unique features as exemplified by *Pleurobrachia*; mention ctenophore larva

ACOELOMATA

Phylum **PLATYHELMINTHES**

(3 hrs)

Classification down to classes; give salient features of the following classes

Class Turbellaria Type: *Dugesia*

Class Cestoda example: *Echinococcus*, *Fasciola*

Class Trematoda example: *Schistosoma*,

PSEUDOCOELOMATA

Super phylum **ASCHELMINTHES**

(3 hrs)

Highlight the heterogeneous nature of animals of this group

Classification down to phyla

Phylum **Nematoda** [=Nemata] characteristic features of *Ascaris* and

Examples: *Ancylostoma*, *Enterobius*, *Wuchereria*

Pseudocoelomate and Coelomate Minor Phyla:

(2hrs)

Pseudocoelomate Minor Phyla:

[Salient features of the following Minor Phyla]

Phylum **Gastrotricha** mention example: *Chaetonotus*

Phylum **Rotifera** example: *Brachionus*

Topics for Assignment / Seminar

- 1] Nutrition in protozoans;
- 2] Reproduction in protozoans;
- 3] Parasitic protozoans of man
- 4] Polymorphism in cnidarians with special reference to siphonophores
- 5] Reef building corals and coral reefs

CORE COURSE I: PRACTICAL- I* A

ANIMAL DIVERSITY NON-CHORDATA Part- I

Code: ZO1B 02(P)

(36 hours) (2 hrs per week)

[Students are expected to make sketches / notes etc., while they study the specimens in the laboratory / field itself. The record must carry notes of all specimens and labelled sketches of mountings and dissections. Emphasis must be on scientific accuracy and not on beauty of sketches.]

Section A: Study of the following specimens

[Choose useful and harmful forms from different habitats. All animals intended for type study are to be included. Slides / museum preparations are to be used; charts / models may be used in exceptional cases.

Students are expected to identify the specimens by their generic names and assign them to the respective phyla and classes)

1. Protists: *Amoeba, Noctiluca, Ceratium, Entamoeba, Trichonympha, Paramecium, Ephelota* [any 4)
2. Poriferans: *Leucosolenia, Scypha, Spongilla, sponge gemmule, spicules* [any 2)
3. Cnidarians: Sedentary hydrozoans: *Hydra, Obelia* [any 1)
Obelia medusa
Pelagic hydrozoans: *Physalia, Velella* [any 1)
Pelagic scyphozoan: *Aurelia / Rhizostoma*
Common anthozoans: *Adamsia, Edwardsia, Madrepora, Fungia, Tubipora, Gorgonia* [any 2)
4. Platyhelminths: Free living flat worm: *Bipalium / Dugesia*
Parasitic flat worms: *Fasciola, Taenia solium* [any 1)
5. Aschelminths: Parasitic round worms: *Ascaris, Ancylostoma, Wuchereria* [any 1)
6. Minor Phyla : *Sipunculus / Bonellia* or any other specimen

Section B: Histology-Transverse sections of a coelenterate, a platyhelminth, a nematode (*Ascaris* male/female)

SECOND SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

ZOOLOGY CORE COURSE- II

ANIMAL DIVERSITY: NON-CHORDATA– PART- II

Code: ZO2B 03T

[DIVERSITY, ADAPTATIONS AND FUNCTIONAL ANATOMY OF
NON-CHORDATE COELOMATES)

[36 hours] [2 hours per week] [2 Credits]

COELOMATA

Phylum **ANNELIDA** (7hrs)

Type: *Neanthes* or *Nereis*

Classification down to classes; salient features of the following classes

Class Polychaeta example: *Arenicola*

Class Oligochaeta example: *Megascolex*

Class Hirudinea example: *Hirudinaria*

Phylum **ARTHROPODA** [11 hrs]

Type: *Panaeus* [details of larval stages not expected)

Classification down to classes; salient features of the following classes

Class Trilobita [brief account only]

Class Merostomata example: *Limulus*

Class Arachnida example: *Palamnaeus*, spider, mention ticks and mites

Class Myriapoda examples: *Scolopendra*, *Spirostreptus*

Class Crustacea example: *Sacculina*, *Eupagurus*

Class Insecta examples: *Lepisma*, *Mantis*, and *Tabanus* Southern bird
wing [butterfly

Phylum **MOLLUSCA**

[8 hrs]

Type: *Pila*

Classification down to classes; salient features of the following classes

Class Placophora example: *Chiton*

Class Bivalvia example: *Perna*

Class Scaphopoda example: *Dentalium*

Class Gastropoda example: *Turbinella*

Class Cephalopoda example: *Sepia*

Phylum **ECHINODERMATA**

[4 hrs]

Structural peculiarities of star fish; water vascular system in detail

Classification down to classes [of extant forms only]; salient features of the following classes and very brief account of examples

Class Crinoidea example: *Antedon*

Class Asteroidea example: *Astropecten*

Class Ophiuroidea example: *Ophiothrix*

Class Holothuroidea example: *Holothuria*

Phylum **HEMICHORDATA**

[1 hr]

Salient features and example: *Balanoglossus*

Coelomate Minor Phyla:

(3 hrs)

Salient features of the following Minor Phyla; mention examples specified [structure and life history not required)

Phylum **Phoronida** example: *Phoronis*

Phylum **Ectoprocta** [=Bryozoa] example: *Bugula*

Phylum **Echiura** example: *Bonellia*

Phylum **Onychophora**

[2 hrs]

Peripatus: [distribution, peculiarities and affinities)

Topics for Assignment / Seminar

- 1] Ecological importance of earthworm and vermiculture
- 2] Larval forms in Crustacea and their significance
- 3] Metamorphosis in insects; Social organization in insects
- 4] Economic importance of mollusks

REFERENCES

- Anderson, D. T.: *Invertebrate Zoology*. 2e, 2001, Oxford Uty. Press (Indian Edn.2006)
- Bhaskaran, K. K. & Biju Kumar, A.: *Economic Zoology*. Manjusha Pubs, Calicut
- Dhami, P. S. & Dhami, J. K.: *Invertebrate Zoology*. R. Chand & Co, New Delhi
- Ekambaranatha Ayyar, M. & Ananthakrishnan, T. N.: *A Manual of Zoology* Vol. I [Part I & II], S. Viswanathan, Madras
- Encarta*: 2004 Edn or new versions [CDs], Microsoft
- Encyclopedia Britannica*: 2004 Edn or new versions [CDs] Britannica.com India
- Jordan, E. L. & Verma, P. S.: *Invertebrate Zoology*. S. Chand & Co, New Delhi
- Kotpal, R. L.: *Modern TB of Zoology: Invertebrates*. Rastogi
- Pechenik, J. A. 4e 2002 *Biology of the Invertebrates*. TMH 2002
- Ruppert, E. E. *et al.*: *Invertebrate Zoology*. 7 e, 2004, Thomson Brooks Cole
- <http://www.ucmp.berkeley.edu>
- <http://www.mbl.edu>
- <http://phylogeny.corne>

CORE COURSE II: PRACTICAL- I* B
ANIMAL DIVERSITY NONCHORDATA Part- II
Code: ZO2B 04(P)

(36 hours) (2 hrs per week)

1. Annelids : Polychaetes *Aphrodite, Chaetopterus, Arenicola, Tomopteris* [any 2:
Common earthworm: *Megascolex / Pheretima*
: Leech: *Hirudinaria, Haemadipsa, Branchellion* [any 2]
2. Arthropods: Items of evolutionary / taxonomic importance -
Limulus, Streptocephalus [Any 2]
: Common fouling barnacle – *Lepas / Balanus*
: Parasitic crustaceans– *Sacculina, Cymathoa, Argulus* [any 2]
: Crustacean of the sandy shore– *Emerita / Albunea*
: Symbiotic crustacean - *Eupagurus*
: Economically important crustacean– prawn, crab [any 1]
: Vectors – *Cyclops*, mosquito, housefly, rat flea [any 2]
: Insect pests – *Lepisma*, termite queen, pest of paddy,
pest of coconut, pest of stored grains [any 5]
: Aquatic insects – *Belostoma, Nepa, Ranatra* [any 1]
: Predatory insect - dragonfly, ant lion, *Mantis* [any 1]
: Insect which camouflages - stick insect / *Phyllium*
: Common myriapods – *Scolopendra/ Scutigera,*
Julus/ Spirostreptus / Jonespeltis [any 2]
: Common arachnids – *Palamnaeus / Buthus,*
spider/ tick /mite [any 2]

9. Mollusks : Inter tidal mollusks – *Chiton, Patella, Haliotis, Onchidium, Aplysia* [any 2]
 : Ornamental gastropods – *Cypraea, Murex, Turbinella* [any 2]
 : Poisonous gastropod – *Conus*
 : Pelecypods of economic importance – *Perna, Pinctada, Teredo, Ostrea* [any 2]
 : Scaphopod - *Dentalium*
 : Cephalopods of economic or evolutionary importance
Sepia, Loligo, Octopus, Nautilus [any 2]
10. Echinoderms: *sea lily, star fish, brittle star, sea cucumber, sea urchin, cake urchin, heart urchin* [any 3]
11. Hemichordate: *Balanoglossus*
12. Onychophora: *Peripatus* (Evolutionary significance)

Section B: Histology: Compare TS of an annelid [*Neanthes* / Earth worm/leech]

Section C: Mountings

1. Earthworm: Setae [a few loose setae] (minor)
2. *Neanthes* or any other polychaete: Parapodium [minor]
3. *Panaeus* : Appendages [minor]
4. Cockroach : Salivary apparatus [Major]
5. Honeybee/ plant bug: Mouth parts [minor]

Section D: Dissections

1. *Panaeus* : Nervous system [Major]
2. Cockroach : Nervous system [Major]

THIRD SEMESTER B. Sc. DEGREE PROGRAMME(Theory)

ZOOLOGY CORE COURSE-III

ANIMAL DIVERSITY – CHORDATA- PART-I

CODE: ZO3B 05T

[TAXONOMY, DIVERSITY, STRUCTURAL ANATOMY AND
ADAPTATIONS OF CHORDATES]

[54 hours] [3 hours per week] [3 credits]

Introduction

[3 hrs]

Chordate characters [fundamental, general and advanced]; chordates versus non-chordates; diversity of chordates; classification down to subphyla; salient features of each subphylum.

Type study with special emphasis to compare various functional systems (Comparative Anatomy) such as Morphology, Integumentary, digestive, respiratory, circulatory, excretory, nervous and reproductive systems also mention the evolutionary significance of each phyla.

Subphylum 1. **UROCHORDATA** [Tunicata]

[5 hrs]

Affinities; add a note on neoteny [paedogenesis]

Classification down to classes

Class: Ascidiacea Type: *Ascidia* [morphology and retrogressive metamorphosis]

Class Larvacea example: *Oikopleura*

Class Thaliacea example: *Doliolum*

Subphylum 2. **CEPHALOCHORDATA**

[4 hrs]

Example: *Branchiostoma* [= *Amphioxus*] morphology, primitive, degenerate and specialized features [affinities and systematic position to be emphasized]

Subphylum 3. **VERTEBRATA**

[3 hrs]

Division 1. AGNATHA

Characters and examples: *Myxine*; *Petromyzon* [mention Ammocoete larva]

Division 2. GNATHOSTOMATA

Super class **PISCES**

[12 hrs]

Type: Mullet

Classification of Pisces down to orders; salient features of the following groups

Class Chondrichthyes [cartilaginous fishes]

Order Selachii examples: *Scoliodon*, *Trygon*

Order Holocephali example: *Chimaera*

Class Osteichthyes [bony fishes]

Order Crossopterygii [coelacanth] example: *Latimeria*

Order Dipnoi [lung fishes] examples: *Neoceratodus*, *Protopterus*,
Lepidosiren [Add a note on distribution of lung fishes]

Accessory respiratory organs in fishes

Order Acanthopterygii [spiny-rayed fishes] examples: *Mugil*,
Rastrelliger

Super class **TETRAPODA**

Class **AMPHIBIA**

[14 hrs]

Type: Frog

Classification of Amphibia down to orders with examples [of extant forms only]

Order Apoda examples: *Ichthyophis*, *Uraeotyphlus*

Order Caudata examples: *Necturus*, *Ambystoma*, mention Axolotl

Order Anura examples: *Bufo*, *Rhacophorus*

Mention discovery of *Nasikabatrachus sahyadrensis*

Type: Calotes

Classification of Reptilia down to subclasses; salient features of the following subclasses; mention the given orders with examples

Subclass Anapsida

Order Cotylosauria [stem reptiles] example: *Hylonomus*

Order Chelonia [common turtles, tortoises etc.] example: *Chelone*

Subclass Lepidosauria [= Super order 1. Lepidosauria under Subclass Diapsida]

Order Rhynchocephalia example: *Sphenodon*

Order Squamata examples: *Chamaeleo*,

Ophidia: Common poisonous and non-poisonous snakes of Kerala. Ptyas, Typhlops, Naja, Daboia, Bungarus; identification key for poisonous snakes

Subclass Archosauria [= Super order 2. Archosauria under Subclass Diapsida]

Order Crocodylia examples: *Crocodylus, Gavialis, Alligator*

Subclass Euryapsida and Subclass Synapsida

Topics for Assignments / Seminars

- 1] Migration of fishes
- 2] Parental care in fishes
- 3] Parental care in amphibians
- 4] Snake venom: nature; composition; antivenin; polyantivenins; prophylaxis

CORE COURSE III: PRACTICAL- I* C
ANIMAL DIVERSITY –CHORDATA-PART I

Code: ZO3B 06(P)

(36 hours) (2 hours per week) (2 credits)

[Students are expected to make sketches / notes etc., while they study the specimens in the laboratory / field itself. The Record must carry notes of all specimens and labelled sketches of mountings and dissections. Emphasis must be on scientific aspects. The record sheets related to part I and part II must be bound together to get a single Record.]

Section A: Study of the following specimens

(Students are expected to identify the specimens by their generic names and assign them to the respective phyla /classes/ orders)

1. Urochordates : *Ascidia*, ascidian tadpole, *Salpa*, *Doliolum* [any 2]
2. Cephalochordate : *Branchiostoma*
3. Agnathans : *Myxine*, *Petromyzon*, Ammocoetes larva [any 1]
4. Fishes : Common elasmobranchs - *Chiloscyllium*, *Stegostoma*,
Sphyrna, *Pristis*, *Trygon*, *Narcine*, *Astrapes* [any 2]
: Common food fishes - *Sardinella*, *Rastrelliger*,
Cynoglossus, *Parastromateus*, *Trichiurus*, *Cybbium*,
Thunnus, *Etroplus*, *Mugil*, *Wallagonia*, *Tilapia*,
Catla, *Cirrhina*, *Labeo*, *Cyprinus* [any 3]
: Fishes with special adaptive features - *Hippocampus*,
Belone, *Hemirhamphus*, *Exocoetus*, *Tetradon*, *Pterois*,
Ostracion, *Heteropneustes*, *Clarias*, *Arius*, *Anabas*,
Channa [=Ophiocephalus], *Echeneis*, *Antennarius*,
Amphisile, eel [*Anguilla* / *Muraena*] [any 5]
5. Amphibians : Common amphibians- *Bufo*, *Hyla*, *Rana*, *Rhacophorus*
Ambystoma/ Axolotl larva, an apodan [any 3]

6. Reptiles : Common lizard- *Hemidactylus*, *Calotes*, *Mabuya* [any 1]
 : Lizards with special adaptations - *Draco*, *Chamaeleon*,
Phrynosoma, *Uromastix* [any 2]
 : Non poisonous snakes: *Ptyas*, *Natrix*, *Eryx*, *Lycodon*, *Typhlops* [any 2]
 : Poisonous snakes - *Naja*, *Daboia* [=Vipera], *Bungarus*, *Echis* [any 2]
 : Sea snake – *Hydrophis* / *Enhydrina*
 : Arboreal snake – *Dryophis* / *Python*

Section B: Histology

1. *Branchiostoma* - T. S. through pharyngeal region

Section C: Mountings

1. Shark/Calotes : Placoid scale [minor]
 2. Shark/Calotes : Brain (minor)

Section D: Dissections

1. Shark/Calotes : IX and X cranial nerves on one side (Major)
 2. Shark/Calotes : Heart and ventral aorta with branches on both sides (Major)
 3. Mullet : [or any other bony fish]: Alimentary canal [Major]

Section E: Osteology

- 1.Frog** :Vertebrae-Typical,8th,9th,10th,Pectoral & pelvic girdle

FOURTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

ZOOLOGY CORE COURSE-IV

ANIMAL DIVERSITY – CHORDATA PART-II

Code: ZO4B 07 T

[TAXONOMY, DIVERSITY, STRUCTURAL ANATOMY AND
ADAPTATIONS OF CHORDATES – AVES AND MAMMALS]

[54 hours] [3 hours per week] [3 credits]

(Give a comparative account of various functional systems of the types specified)

Class **AVES** [27 hrs]

Type: Columba

Classification of Aves down to the orders specified; mention one example each

Subclass Archaeornithes

Order Archaeopterygiformes example: *Archaeopteryx* – brief account

Subclass Neornithes

Super order Palaeognathae [=Ratitae]

Order Casuariiformes example: *Casuarius* [cassowary]

Order Dinornithiformes [=Apterygiformes] example: *Apteryx* [kiwi]

Order Rheiformes example: *Rhea*

Order Struthioniformes example: *Struthio* [ostrich]

Super order Neognathae [=Carinatae]

Order Galliformes [pheasants, quail, turkeys, grouse]

example: *Pavo cristatus*

Order Anseriformes [screamers, water fowls] example: *Anas*

Order Passeriformes [perching birds] example: *Passer domesticus*

Order Piciformes	[wood peckers, barbets, honey guides] example: <i>Dinopium</i>
Order Coraciiformes	[kingfishers & allies] example: <i>Alcedo</i>
Order Apodiformes	[swifts, humming birds] example: <i>Micropodus</i>
Order Strigiformes	[owls] example: <i>Bubo</i>
Order Cuculiformes	[cuckoos, roadrunners, turacos] example: <i>Eudynamys</i>
Order Psittaciformes	[parrots, lories, cockatoos] example: <i>Psittacula krameri</i>
Order Gruiformes	[cranes, rails, coots, bustards] example: <i>Choriotis</i>
Order Charadriiformes	[plovers, gulls, terns, auks, sand pipers] example: <i>Tringa</i>
Order Columbiformes	[pigeons, doves, dodos, sand grouse] example: <i>Columba</i>
Order Falconiformes	[diurnal birds of prey – falcons, hawks] example: <i>Mylvus</i>
Order Ciconiiformes	[herons, storks, ibis, spoon bills] example: <i>Ardea</i>
Order Pelecaniformes	[pelicans, cormorants] example: <i>Pelecanus</i>
Order Sphenisciformes	[Impennae] example: <i>Aptenodytes</i> [penguin]
Order Phoenicopteriformes	[flamingos] example: <i>Phoenicopterus</i>

Add a note on extinct birds: passenger pigeon [*Ectopistes migratorius*], dodo [*Raphus cucullatus*], pink-headed duck [*Rhodonessa caryophyllacea*], elephant bird [*Aepyornis*] rediscovery of Jerdon's courser [*Cursorius bitorquatus*]

Migration in birds and flight adaptations in birds

Type: *Oryctolagus*

Classification of Mammalia down to the orders cited with examples specified

Subclass Prototheria Infraclass Ornithodelphia [egg-laying mammals]

Order Monotremata examples: *Ornithorhynchus* [platypus], *Tachyglossus* [= *Echidna*]

Subclass Theria Infraclass Metatheria [marsupials]

Order Marsupialia examples: *Didelphis* [opossum), *Macropus* [kangaroo)
Infraclass Eutheria [true placental mammals]

Order Edentata examples: *Bradypus* (sloth), *Dasypus* (armadillo)
Myrmecophaga (spiny ant eater)

Order Pholidota example: *Manis* (pangolin / scaly ant eater)

Order Lagomorpha [rabbits and hares]

Order Rodentia examples: *Funambulus*, *Ratufa*

Order Insectivora examples: *Paraechinus* (hedgehog), *Suncus*
(=*Crocidura*)

Order Dermoptera examples: *Cynocephalus* (*Galeopterus* - flying lemur)

Order Chiroptera examples: *Pteropus*, *Pipistrellus*

Order Primates examples: *Loris*, *Macaca*, *Gorilla*, *Pongo*, *Hylobates*,
Homo

Order Carnivora examples: *Phoca* (seal), *Odobenus* (walrus), *Panthera*
sps. *Viverricula indica* [civet]

Order Cetacea examples: *Physeter* (sperm whale] *Delphinus* (dolphins),
Phocaena (porpoise) *Balaenoptera* (baleen whale]

Order Artiodactyla examples: *Sus scrofa cristatus*, *Gaur*, *Giraffa*,
Hemitragus [tahr], *Cervus*, *Axis axis* (spotted

deer), *Antelope cervicapra* [antelope, black buck]

Order Perissodactyla examples: *Equus caballus* (horse), *Rhinoceros*

Order Sirenia examples: *Trichechus* (manatee), *Dugong*

Order Proboscidea examples: *Elephas maximus indicus* [Indian elephant] and *Loxodont a africana* [African savanna elephant]
Loxodonta cyclotis [African forest elephant]

Topics for seminar: _

- 1] Aquatic mammals and their adaptations
- 2] Dentition in mammals [adaptations related to food]

REFERENCES:

Bhaskaran, K. K. & Biju Kumar, A.: Textbook of Zoology (Chordata), Manjusha

Colbert's *Evolution of the Vertebrates*

David Burney: *Animal*, Dorling-Kindersley

Dhami, P. S. & Dhami, J. K.: *Chordate Zoology*. R. Chand & Co

Ekambaranatha Ayyar, M. & Ananthakrishnan, T. N.: *A Manual of Zoology*. Vol. II
Part I & II

Encarta: (CDs), 2004 Edn or new versions, Microsoft

Encyclopedia Britannica: (CDs), 2004 Edn or new versions, Britannica, India

Harvey Pough, F. *et al.*: *Vertebrate Life*. Pearson Edn Inc, Indian Edn

Induchoodan: *Keralathile Pakshigal*. 1996, Kerala Sahitya Academy, Trichur

Jordan, E. L. & Verma, P. S.: *Chordate Zoology* S. Chand & Co, New Delhi

Kardong, K. V.: *Vertebrates: Comparative Anatomy, Function and Evolution*. 1995, WCB

Kotpal, R. L.: *Modern Textbook of Zoology: Vertebrates*. Rastogi

Prater, S. H.: *The Book of Indian Animals*. 1971, BNHS

Romer, A. S: *The Vertebrate Body*; 1992 reprint, Vakils, Feffer & Simons, Bombay

Salim Ali: *Birds of Kerala*. 2 e, 1969, O U P

Salim Ali: *The Book of Indian Birds*. BNHS, Oxford

Young, J. Z.: *Life of Vertebrates*. OUP

<http://www.oit.itd.umich.edu>

CORE COURSE IV: PRACTICAL- I* D
ANIMAL DIVERSITY –CHORDATA-PART II

Code: ZO4B 08(P)

(36ours) (2 hours per week) (2 credits)

1.Birds-

- 1.Fossil . Archaeopteryx
- 2.Flightless bird.Rhea,Struthio [any 1]
- 3.Aquatic birds.Jacana,duck,teal [any 1]
- 4.Wet land birds.heron,ibis,stroke,pelicans [any 2]
- 5.Migratory birds.pelicans,cranes,flamingos [any 1]
- 6: Features and adaptations of: duck, parrot, king fisher, owl, kite and wood pecker [draw sketches of the beaks and feet of 3 birds)

[Watch birds in their natural habitat and prepare a field note]

- 2. Mammals** : Common insectivore – *Suncus, Hedgshog* [any 1]
: Common rodent – rat/ bandicoot/ squirrel [any 1]
: Common bat of Kerala [any 1]
: A primate – *Loris* or any other item

3.Osteology:

Rabbit or any other mammal: skull [details of dentition], Atlas, axis, typical vertebra, scapula and pelvic girdle

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

ZOOLOGY CORE COURSE –V

Code: ZO 5B 09T

**ENVIRONMENTAL BIOLOGY, WILDLIFE CONSERVATION AND
TOXICOLOGY,**

[54 hours] [3 hours per week] [3 credits]

Section A: ENVIRONMENTAL BIOLOGY (32 hrs)

1. Ecological tools and Techniques (7 hrs)

1. Sampling of animal populations
 - (i) Trapping and collecting various groups of flying insects (aquatic organisms, soil organisms, birds and mammals).
 - (ii) Marking of animals
 - (iii) Age determination techniques
 - (iv) Sex determination techniques
 - (v) Determination of home range and territory
 - (vi) Estimation of number of animals in population
 - (vii) Indirect method of estimating wild animals by their signs and symptoms.
2. Mapping of the study area
3. Remote sensing.

2. Ecosystem and Energetics (4 hrs)

- (a) Definition, scope and branches of ecology, Habitat, Niche, Community, Autecology and Synecology.
- (b) Energy flow and energetics of ecosystem
- (c) Solar energy and photosynthetic and chemosynthetic production

(d) Energy transformations and energy transfer

(e) Laws of thermodynamics

3. Biogeochemical cycles (4 hrs)

(a) Basic types of biogeochemical cycles - Gaseous cycle - carbon and nitrogen cycles; sedimentary cycle

(b) Recycling pathways and recycle index

4. Limiting factors (2 hrs)

Basic concepts - Liebig's law of minimum - Shelford's law of tolerance, combined concept of limiting factors

5. Population Ecology (4 hrs)

Properties of population - density, natality, mortality, age distribution, biotic potential, environmental resistance and carrying capacity, population growth forms, J and S shaped curves, migration, emigration and immigration

6. Community Ecology (4 hrs)

Biotic community - definition, characteristics and classification, species diversity, fluctuations, stratification, succession, ecotone and edge effect

7. Population interactions (3 hrs)

Intraspecific and interspecific associations - Positive and negative interactions: Mutualism, Commensalism, Parasitism, Predation, Competition

8. Man and Environment (4 hrs)

(a) Sustainable development (in brief)

(b) Destruction of habitat and its consequences - wetland, paddy fields, mangrove, river encroachment, sand and clay mining, ecological impacts of tourism

Section B: WILDLIFE CONSERVATION (18 hrs)

1. Biodiversity (12 hrs)

(a) Introduction: alpha, beta and gamma diversities. Mention Shannon diversity index and Simpson's dominance index.

- (b) Hot spots of biodiversity. Mention hotspots in Indian region (Western ghats and Sreelanka, Eastern Himalayas and Indo Burma)
- (c) Threats to biodiversity (Habitat modification, pollution, poaching, etc.)
- (d) Role of systematics in biodiversity, Extinction of species.
- (e) Natural resources and conservation-Strategeies of conservation, Natural reserves,Classification of natural resourses.
- (f) Wild life conservation,Wild life (protection Act)1972,Conservation projects. Project Tiger,Elephant,Lion,Crocodile,Dolphins, Swamp deer,Blackbuck and Turtle.
- (g) Endangered fauna and flora.
- (h) Important sanctuaries , National parks and Biosphere Reserves of India.
- (i) Mention IUCN categories and Red data book.
- (j) Conservation of biodiversity - in situ and ex situ conservations. Mention conservation of germplasm.

2. Global Strategy for Conservation

(6 hrs)

- (a) Stockholm Conference / Declaration (1972)
- (b) Nairobi Conference / Declaration
- (c) Rio Declaration (Earth Summit, 1992)
- (d) CITES
- (e) Biodiversity Convention of UNCED
- (f) Kyoto Agreement (1997)
- (g) Johannesburg Conference (2002)
- (h) World Summit on Sustainable Development
- (i) UNEP and its major strategies
- (j) Protection of plant varieties and farmer's right Act (2001)
- (k) Biodiversity Act 2002
- (l) Seed Bill 2005
- (m) Wildlife Act 1972 and its Amendments

Section C: TOXICOLOGY

(4 hrs)

1. Toxicants and public health hazards

- (a) Toxic chemicals (pesticides, automobile emissions, heavy metals, fertilizers, food additives, xenobiotics, radioactive wastes).
- (b) Indian law of drug and poisons
- (c) Levels of toxicity- Acute, sub acute, chronic, LD₅₀, LC₅₀
- (d) Common bacterial poisoning (botulism)
- (e) Behavioural Toxicology

Topics for Assignment/Seminar

- 1. Environmental ethics and legislation
- 2. Individual responsibilities – Role of Governmental and Non Governmental Organisations in biodiversity conservation
- 3. Survey of animal poisons
- 4. Environmental pollution

References:

Environmental Biology, Conservation Biology & Toxicology

Alan Beebi and Anne Maria: First Ecology – Ecological Principles and Environmental Issues, IInd edition, Oxford University Press.

Aggarwal, S.K-Foundation course in Biology 2nd edition-Ane's student edition

May R. M. and Mc Lean: Theoretical Ecology – Principles and Applications, Oxford Uty Press.

Misra: Essentials of Environmental Studies, Ane Books Pvt. Ltd.

Agarwal, K.C.: *Environmental Biology*. 2001, Nidi Pubns, Bikaner.

Agrawal, K.C.: *Biodiversity*. 1990, Agro.

Anonymous: *Conservation of Biological Diversity in India: An Approach*. 1994, Ministry of Env't. & Forests, Govt. of India.

Balachandran Thampi, K. *et al.*: *The Natural Resources of Kerala*. 1997, WWF for Nature - India, [Kerala State Office], Trivandrum.

Chatterjee, B.: *Environmental Laws - Implementation Problems*. Deep & Deep Pubs.

Cunningham & Cunningham: *Principles of Environmental Science*. 2002, TMH.

Cutter: *Environmental Risks and Hazards*. PHI [EEE].

Dev, S. C.: *Environmental Management*, 2003, Jaico Pub., New Delhi.

Hawkins, R. E.: *Encyclopedia of Indian Natural History*, 2001, BNHS/OUP.

Jadhav, H. & Bhosale, V. M.: *Environmental Protection and Laws*. 1995, Himalaya.

Kumar, A.: *Textbook of Environmental Science*, 2004, APH Publishing Co., ND.

Kumar, A.: *Environmental Pollution and Health Hazards in India*. Agro.

Kumar, U.: *Biodiversity Principles and Conservation*. 1999, Agro.

Kurian, J. & Nagendran, R.: *Essentials of Environmental Studies*, 1e, 2003, Pearson Edn.

Perry, A. S. et al.: *Insecticides in Agriculture and Environment*. 1998, Narosa.

Purohit, S.S.: *Ecology, Environment and Pollution*, 2003, Agro.

Sharma, P.D.: *Ecology and Environment*. 7 e, 2002-03, Rastogi.

Richard Primack: *Essentials of Conservation Biology*, Sinaur Associates.

Sharma, P.D.: *Toxicology*.

Tikadar, B.K. *Threatened Animals of India*, ZSI Publication, Calcutta.

Chapman and Reiss: *Ecology*, Cambridge Low Price Editions.

Donald T. Haynie: *Biological Thermodynamics*, Cambridge University Press.

Soper et al., *Biological Science*, Cambridge Low Price editions.

Ananthkrishnan T. N., *Animal Biodiversity Patterns and Process* – Scientific Publishers.

Ahluwalia, V.K. and Sunitha Malhotra: *Environmental Science*, Ane Books Pvt. Ltd.

Begon: *Ecology – From individuals to ecosystems*, 4th edition, John Wiley.

Ramakrishnan, P.S- *Ecology and Sustainable Development* 2nd edition – National Book Trust India
India 2009- Publication division Govt.of India

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME(Theory)

ZOOLOGY CORE COURSE –VI

Code: ZO 5B 10T

ETHOLOGY, EVOLUTION AND ZOOGEOGRAPHY

[54 hours] [3 hours per week] [3 credits]

Section A: ETHOLOGY (14 hrs)

- 1. Brief history, scope and branches of ethology. (2 hrs)**
- 2. Patterns of behaviour (5 hrs)**
 - (a) Innate behaviour (orientation taxes/ kinesis), simple reflexes and instincts, motivation and categories of behavior.
 - (b) Learned behaviour - habituation, conditioned reflex, trial and error learning; latent learning, imprinting, insight learning, memory and learning
- 3. Biological clocks / rhythms (4 hrs)**

Photoperiod, circadian rhythm; migration, navigation and homing instinct; diapause, hibernation and aestivation (in brief)
- 4. Sociobiology (3 hrs)**

Social group in termites and elephants, pheromones and social behavior.
(mention human pheromones also)

Section B: EVOLUTION (32 hrs)

- 1. Introduction: (2 hrs)**

Concepts of inorganic and organic evolution, History of evolutionary thought: Ideas of evolution during Pre-Darwinian, Darwinian and Post-Darwinian periods. (brief account).
- 2. Course of Evolution: (6 hrs)**
 - (a) **Origin of life:** i) Theory of abiogenesis ii) Theory of biogenesis iii) Theory of special creation iv) Theory of Panspermia and v) Biochemical origin of life -

Modern hypothesis – Oparin-Haldane Theory . Major steps in the biochemical evolution of the life (brief account): Origin of Earth and the primordial atmosphere, formation of organic molecules, formation of macromolecules or polymers, and formation of coacervates, microspheres, protocells and full fledged living cells. Experimental evidence for biochemical origin of life: Urey- Miller experiment. Other experiments , Modern ideas on the origin of life.

(b) **History of Life on Earth:** Geological time scale (simple chart), mention Cambrian explosion.

(c) **Fossils, Fossilization and Dating of fossils** (brief account).

(d) **Living fossils:** mention common features and examples.

3. Evidences of Organic Evolution: (4 hrs)

i) Morphological and anatomical evidences: Homologous, analogous and vestigial structures and their evolution. ii) Physiological and biochemical evidences: examples. iii) Embryological evidences: examples, Biogenetic Law. iv) Palaeontological evidences: Kinds of fossilization, formation of sedimentary rocks, determination age of rocks and fossils, conclusion drawn from fossil records (brief account). v) Taxonomical evidences: evolution based principles of classification, mention phylogenetic tree.

4. Theories of Evolution: (4 hrs)

Lamarckism: Explanation of the major postulates of the Lamarck's theory with examples, Criticism against Lamarckism, Neo-Lamarckism, Present status of Lamarckism. **Darwinism:** Explanation of important postulates of Darwin's theory, Examples for natural selection, Criticism against Darwinism, Neo-Darwinism (Synthetic theory of evolution).

5. Modern Concepts of Evolutionary Process: (3 hrs)

Genetic basis of evolution: i) Mutations (gene and chromosomal mutations-brief account), ii) Variations: somatic or environmental variations and genetic or hereditary variations, iii) Hardy-Weinberg Principle: Hardy-Weinberg Equilibrium , Factors that upset Hardy-Weinberg Equilibrium, iv) Genetic drift : effects on population, Bottleneck effect and Founder effect, genetic drift and natural selection, importance of genetic drift in evolution; Theory of Punctuated equilibrium and its relevance.

6. Nature of Evolution: (3 hrs)

Species and Speciation: Species concept: Morphological and biological species concepts, General characteristics and subdivisions (sub species, semispecies, sibling species, cline and deme) of species; Speciation: Types of speciation-i) Phyletic speciation (autogenous and allogenuous transformations) ii) True speciation (Instantaneous and gradual speciation [allopatric and sympatric speciation]).

7 Isolation and Isolating Mechanisms: (3hrs)

Types of isolating mechanisms i) Geographic isolation : mention examples, ii) Reproductive isolation (a) Prezygotic isolation (habitat, seasonal, ethological, morphological, physiological and cytological isolation with examples.), (b) Postzygotic isolation (hybrid inviability, hybrid sterility and F₂ breakdown isolation with examples.).

Adaptive Radiation (Divergent Evolution): cause and significance, adaptive radiation in Darwin's finches.

Convergent Evolution: mention examples.

Pre-adaptation: mention examples.

8. Evolution of Vertebrate Groups: (2 hrs)

Evolution of agnathans, fishes, amphibians, reptiles, birds and mammals (brief account).

9. Evolution of Horse: (2hrs)

Time and place of origin, major evolutionary trends, phylogeny of probable sequence species of horse of Eocene, Oligocene, Miocene, Pliocene, and Pleistocene forms, Orthogenesis .

10. Evolution of Modern Man: (3 hrs)

Evolutionary trends in humans, Ancestors of Primates, Apes-the closest relatives of man, Fossil ancestors of man: *Dryopithecus*, *Australopithecus* (The Man-Ape of Africa), *Homo habilis* (The Handy Man), *H. erectus*, *H. neanderthalensis* (Neanderthal man), The Cro-magnon, *Homo sapiens* (Modern man); Socio-cultural evolution (brief account).

Section C: ZOOGEOGRAPHY

(8 hrs)

1. Animal Distribution

(4 hrs)

- (a) Geographic distribution of animals - cosmopolitan distribution, discontinuous distribution, bipolar distribution and isolated distribution
- (b) Factors affecting animal distribution; Barriers to animal distribution - Physical barriers (topographical and climatic); biological barriers.

2. Zoogeographical realms

(2 hrs)

Zoogeographical regions with specific fauna (fauna regions): Palaearctic region, Oriental region, Australian region, Ethiopian region, Nearctic region and Neotropical region; insular fauna; Mention continental and oceanic islands.

3. Biogeography of India (2 hrs)

Biogeographical zones of India

Trans Himalayan zone; Himalayan zone; Desert zone; semiarid zone;

Western Ghats zone; Deccan plateau zone; Gangetic plain zone; North east

zone. Coastal zone; Islands present near the shore line.

Topics for Assignments / Seminars

- 1. Historical aspects of evolution - Inorganic and Organic
- 2. Fossils and fossilisation
- 3. Evolution of horse
- 4. Polyplody and Evolution

REFERENCES

For Ethology & Evolution

Susantha Goonathilake: Merged Evolution – Gordon and Breach Publishers.

Andrews, M.I. & Joy, K.P.: *Ecology, Evolution & Zoogeography*. S.M. Book Depot, Changanassery.

Boulenger, E.G. *Animal behaviour*, 1994, Atlantic Pub. & Distributors

Darwin, C.: *The Origin of Species*, 6e. OUP.

Desmond Morris, 1990. *Animal Watching* (Field guide), Crown Pub Co., London.

Dobzhansky, Th.: *Genetics and the Origin of Species* 1951, Columbia Uty. Press.

Dobzhansky, Th. *et al: Evolution*, Surjeet Pubn., Delhi. *India and South East Asia*. CBS Pubs., New Delhi.

Gamow.George(1970) *The Creation of the Universe*,BantanBooks,New York

Gott.V(1977) *The Amazing but Knowable Universe*),Progress publishers,Moscow

CORE COURSE V &VI: PRACTICAL II*-A
ENVIRONMENTAL BIOLOGY, WILDLIFE CONSERVATION,
TOXICOLOGY,ETHOLOGY, EVOLUTION & ZOOGEOGRAPHY

Code: ZO 5B-11(P)

[54 hours] [2 hours per week] [2 credits]

I. Ethology (Any 1)

1. Demonstration of the effect of alarm pheromones in ants
2. Demonstration of phototaxis using earth worm

II. Evolution

Study of models, charts and specimens related to comparative study of:

1. Study of homologous organs (limbs of 5 different groups of vertebrates)
2. Study of analogous organs (wings of bird, insect and bat)
3. Study of evolution of man based on three hominid fossils
4. Study of connecting links (*Archeopteryx* and *Peripatus*)
5. Study of any four vestigial organs in humans
6. Study of adaptive radiation in feet of birds / mouth parts of insects

III. Zoogeography

- 1 .Preparation of world map to show six zoogeographical realms
2. Preparation of world map to show islands of zoogeographical significance.
3. Preparation of world map to show Wallace line, Weber line and Wallacea
4. Locate the distribution of following animals in the world map:
Peripatus, lung fishes, *Sphenodon*, monotremes, marsupials

IV. Environmental Biology, Conservation Biology & Toxicology

1. Estimation of dissolved O₂ using Winkler method (in pond and tap water)
2. Estimation of dissolved CO₂ in pond and tap water
3. Determination of pH using pH paper / digital pH meter
4. Extraction of soil organism by hand picking, floatation and Berlese funnel method
5. Study of marine planktons
6. Study of food chain and food web.

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

ZOOLOGY CORE COURSE- VII

Code: ZO 5B12T

CELL BIOLOGY AND GENETICS

(54 hours) (3 hours per week) (3 credits)

Section A: CELL BIOLOGY (27 hours)

I. Scientific instruments and techniques in Cell Biolog

1. Microscopy: (4 hrs)

- (i) Light microscopy: (a) Simple microscope (b) Compound microscope: Principles and uses; Use of oil immersion objectives; Use of ocular micrometer and stage micrometer for microscopic calibration (Micrometry); Use of cameralucida, principle and uses. Mention phase contrast microscope, Fluorescence microscope
- (ii) Electron microscopy: Principle, applications, advantages and disadvantages. Mention (a) Transmission Electron Microscope (TEM), (b) Scanning Electron Microscope (SEM). (c) Scanning-tunnelling microscope (d) Atomic force microscope .

2. Histological Techniques: (2 hrs)

- (i) Microtomy: Rotatory microtome (brief description), uses
- (ii) Preparation of materials for light microscopy (for temporary and permanent), fixation: Common fixatives, such as buffered formalin, ethanol, Bouin's solution and Carnoy's fluid; Common histological stains: Haematoxylin, Eosin and Leishman's). Vital stains: Neutral red and Janus green; Mounting medium: DPX, Canada Balsum

3. Histochemicals (1hr)

Mention the techniques for the demonstration of proteins (mercuric bromophenol blue), carbohydrates (PAS) and lipids (Sudan)

II. Structure of eukaryotic cell (2 hrs)

Plasma membrane –Unit membrane concept. Structure (fluid-mosaic model) and Chemical organization; Functions – Transmembrane transportation –diffusion,osmosis, active transport,pinocytosis,phagocytosis. Glycocalyx – Modifications of plasma membrane

2. Cell Communication: (1hr)

Cell signalling: Molecules and receptors involved in transduction, Mechanism of signal transduction.

3. Ribosomes: (2hrs)

Types of ribosomes in prokaryotes, eukaryotes and mitochondria; Structure and chemical composition of subunits; free and attached ribosomes, monosomes, polysomes; functions of ribosomes; biogenesis of ribosomes.

4. Mitochondria: (2 hr)

Structure and Functions of mitochondria, mitochondriogenesis

5. Lysosomes: (1 hr)

Structure and chemistry, kinds of lysosomes, polymorphisms, enzymes in lysosomes, concept of GERL (Golgi body – Endoplasmic Reticulum – Lysosome complex), functions of lysosomes.

6. Centrioles and basal bodies: (1hr)

Structure, chemical composition and functions.

7. Golgi complex:

Morphology, chemical components, secretory and endocytic pathways, functions, golgiogenesis.

8. Cytoskeleton: (1hr)

Microtubules, microfilaments and intermediate filaments and their composition; formation of mitotic apparatus; functions. (Brief account only).

- 9. Interphase nucleus: (3hrs)**
 General structure and functions, and nucleo-cytoplasmic index, Nuclear envelope : Structure , nuclear pores and pore complex formation, Functions, Nucleoplasm, Nucleolus: Structure, composition, nuclear cycle, nucleolar organizer, functions; Chromosomes: Chromatin, euchromatin, heterochromatin; Nucleosomes : chemical composition, Nucleosome packing , organization of chromatin.
- 10. Giant chromosomes: (1hr)**
 Polytene chromosomes: occurrence, structure, puffs and bands, endomitosis, significance in cytological studies.
 Lamp brush chromosomes: occurrence, structure, loops, significance.
- 11. Cell Divisions (3hrs)**
 Cell division – Cell cycle; G₁, S, G₂ and M phases – Check points.
 Amitosis: brief account only.
 Mitosis: description of all stages, cytokinesis and significance.
 Meiosis: description of all stages, nature of chromosomes during different stages and significance; mention stage G₀ as an elevated part of cell cycle.
- 12. Cytogenetics of cancer: (2 hrs)**
 Types of cancer, characteristics of cancer cells, Carcinogenesis (theories: brief account).
- 13. Cell aging: (1 hr)**
 Apoptosis – Cell death

Section-B GENETICS (27 hrs)

- 1. Variations from Mendelian ratios: (2 hrs)**
 Incomplete dominance and co-dominance, lethal genes, Pleiotropism

- 2. Interaction of genes: (3 hrs)**
- Allelic and non allelic interactions, factor hypothesis, inheritance of comb pattern in Poultry,, supplementary genes, complementary genes, epistasis, duplicate genes, polymeric genes, modifying genes, atavism, penetrance, expressivity, polygenic (quantitative) inheritance, skin colour in man
- 3. Multiple alleles: (3 hrs)**
- Definition, characteristics and examples: coat colour in rabbits, mention isoalleles, blood group alleles, genetics of ABO system, mention other system of blood grouping; MN, M, N, Levin, and Bombay; Rh factor and erythroblastosis foetalis; (problems related to blood groups inheritance are to be worked out)
- 4. Linkage, crossing over and recombination: (4 hrs)**
- Morgan's work on *Drosophila*, define chromosome theory of linkage; linkage types with examples: complete and incomplete linkage, linkage groups, crossing over; factors influencing linkage and crossing over; recombination; linkage map [Definition and principle]
- 5. Sex determination: (3 hrs)**
- Sex determination and sex differentiation, sex chromosomes; X and Y male heterogametic and female heterogametic chromosome mechanism of sex determinations [XX-XO, XX-XY, ZZ-ZW types]; Genic balance (ratio) theory of Bridges, environmental and hormonal influence of sex determination: sex in honey-bees and *Bonellia*; short notes on intersexes; gynadromorphism
- 6. Sex-linked, sex-influenced and sex-limited characters: (4 hrs)**
- Types of sex-linkage – sex linkage in man [colour blindness as an example] holandric genes [hypertrichosis as an example]; sex-influenced traits and sex-limited traits [definition and examples] – Pedigree analysis – importance of Y; dosage compensation – Barr body – Lyon hypothesis

7. Mutation: (3 hrs)

Definition – kinds of mutations – gene mutations – molecular basis of gene mutations – substitution mutations and frame shift mutations – mechanisms – factors influencing mutations – induced mutations – mutagens – Detection of mutations (CIB Method)

Chromosome mutations – numerical and structural changes

Numerical changes: euploidy and aneuploidy with subdivisions

Structural changes: deletion, duplication, insertion, inversion, translocation

Mention significance of mutations in speciation and breeding

8. Human Genetics: (4 hrs)

Normal chromosome complement in human beings, classification and grouping of human chromosomes (Patau's scheme), Gene therapy. Chromosomal anomalies and disorders: Down's, Patau's, Edward's and Cri-du-chat syndromes, sex chromosomal anomalies like Turner's and Klinefelter's syndromes), Gene mutations: autosomal mutations like albinism, PKU, alkaptonuria, galactosemia, Tay-Sach's syndrome, Gaucher's disease, sickle cell anaemia, thalassemia, brachydactyly, sex chromosomal mutations: haemophilia, Lesch-Nyhan syndrome, dermal hypoplasia Polygenic traits: cleft palate / lip, club foot, hydrocephaly

9. Genetic counselling: (1 hr)

Eugenics, Euthenics and eugenics.

Topics for assignments/seminars

1. Twin studies in Genetics
2. Human cloning – pros and cons.
3. **Cytoplasmic or extra nuclear inheritance:**
Shell coiling in *Limnaea*, cytoplasmic organelles, DNA in chloroplast and mitochondria and endo-symbionts like kappa particles and sigma .
4. Proteasomes: Structure; ubiquitin-tagged protein degradation
5. Microbodies : Peroxisomes and glyoxysomes, Structure, functions and origin of microbodies.

REFERENCE

- Bhaskaran, K.K. & Biju Kumar, A.: *Cell Biology, Genetics & Molecular Biology*.
Manjusha.
- Brooks, R. J.: *Genetics: Analysis and Principles*. 1999, Addison Wesley
- Burns, G. W. & Bottino, P. J.: *The Science of Genetics*. 6/7e, Maxwell McMillan
- Curt Stein: *Principles of Human Genetics*. 1960, Euresia Pubg.
- De Roberties, E. D. P. *et al.*: *Cell and Molecular Biology* TMH
- Dobzhansky, Th.: *The Genetics and Origin of Species*. Columbia Uty. Press
- Dowben: *Cell Biology*
- Fairbanks, D. J. & Anderson, W. R.: *Genetics*. Brooks / Cole Pubg. Co. 1999
- Gangane, S. D.: *Human Genetics*. 2e, 2000, B. I. Churchill Livingstone, N D.
- Gardner, E. J. *et al.*: *Principles of Genetics*. 8e, 200 J W & S.
- Gerald Karp: *Cell Biology*.
- Gerlad Karp: *Cell and Molecular Biology*.
- Good Enough, U.: *Genetics*. Halt, Reinharts & Winston
- Gupta, P. K.: *Cell and Molecular Biology*, 2e, 2002, Rastogi Pubs., Meerut.
- John Ringo: *Fundamental Genetics*- Cambridge University Press.
- Kleinsmith, L. J. & Kish, V. M.: *Principles of Cell and Molecular Biology*. 2e,
1995, Harper Collins College Pubs
- Lewin, B. *Genes IX edition*. OUP.
- Loewy, Sickewitz, *Cell Structure and Function*
- Mange, E. J. & Mange, A. P.: *Basic Human Geneics*. 1999. Indian edn. Rastogi
- McCusik, V. A.: *Human Genetics*. PHI.
- Micklos, D. A. & Freyer, G. A.: *DNA Science*. 1990, Cold-Spring Harbour Lab
Press.
- Niel O. Thorpe: *Cell Biology*.

- Philip Sheeler and Donald E. Bianchi: *Cell Biology – Structure, Biochemistry and Functions*.
- Primrose, S. B. *et al.*: *Principles of Gene Manipulation*, 6e, 2000, Blackwell Science.
- Ricki, L.: *Human Genetics: Concepts and Applications*. WCB MGH
- Red: *New Clinical Genetics*.
- Robert H. Tamarin, *Principles of Genetics*.
- Roy, R. N.: *Medical Biophysics*, 1e, 2001, Books & Allied, Calcutta
- Sharma, A. K. & Sharma, A.: *Chromosome Techniques*. 1990, Butterworth
- Sharma, A., *Chromosomes*. 1992, Oxford & IBH
- Sharma, B. K.: *Instrumental Methods of Chemical Analysis*. Goel Pub House
- Sinnott, E. M. *et al.* *Principles of Genetics*, 1958, MGH
- Snustad & Simons: *Principles of Genetics*. 1997, JW & S
- Stine, C. J.: *The New Human Genetics*, W.C. Brown
- Strachan, I. & Read, A.P.: *Human Molecular Genetics*. 1999, JW & S
- Strickberger: *Genetics*, 4e, W.C. Brown Pub., Maxwell Macmillan.
- Verma, P.S. & Agarwal, V.K.: *Cytology*. S. Chand & Co.
- Vijayakumaran Nair, K. & Jayaprakash, M.: *Cell Biology, Genetics, Molecular Biology*. Academica, TVM.
- Weaver, H.: *Genetics*. 1997, W.C. Brow

CORE COURSE VII: PRACTICAL- II*B

CELLBIOLOGY AND GENETICS

Code: ZO5B13(P)

(54 hours) (3 hours per week) 3 credits

Section A: Cell Biology

1. Staining of eukaryotic cells: Temporary mount of buccal epithelial cells to study their structure and observe Barr body.(Major)
2. Mitosis: stages in onion (*Allium cepa*) root meristem (squash preparation)
3. Calculation of mitotic index and metaphase index in root meristem of *Allium cepa*
4. Meiosis: stages in testis of grass hopper (demonstration only)
5. Giant chromosomes in Diptera: (*Drosophila* / *Chironomus* larvae) salivary gland cells (demonstration only)
6. Study of the parts of a compound microscope, its proper use and maintenance (Minor)
7. Measurement of size of microscopic objects using ocular and stage micrometers (Major)
8. Study of the applications of centrifuge. Demonstration of cell fractionation and centrifugation using fish liver (or any other specimen)

Section B: Genetics

1. Scheme of Pedigree chart
2. Study of sex-linked inheritance (haemophilia and colour blindness)
3. Study of inheritance of human traits: (use Pedigree charts). Blood groups, widow's peak, eye colour
4. Genetic problems on Monohybrid, dihybrid crosses, blood groups, incomplete dominance and sex-linked inheritance (minimum ten problems to be worked out)

5. Study of normal male and female human karyotype (use photographs or xerox copies) and abnormal human karyotypes (any two)
6. Study of genetic syndromes: Down's, Klinefelter's and Turner's, Edward's
- 7 Study of phenotypic characters in male and female *Drosophila*

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME(Theory)

ZOOLOGY CORE COURSE- VIII

Code: ZO5B 14 T

**GENERAL METHODOLOGY IN SCIENCE, BIostatISTICS
AND INFORMATICS**

(54 hours) (3 hrs per week) (3 credits)

Section A- GENERAL METHODOLOGY IN SCIENCE (20 hrs)

I. Science and Scientific Studies (2hrs)

Definition; Types of knowledge: Theoretical, Practical and Scientific knowledge;

Science as a human activity; scientific attitude; Empiricism; Science disciplines; Interdisciplinary approach.

II. Scientific Methods (7 hrs)

Major steps: Observation, Defining the problem, Collection of information, Formulation of a hypothesis, Experimentation, Analysis of the results and Conclusion based on interpretation of the results.

Methods in scientific enquiry: Inductive and deductive reasoning.

Hypothesis: Formulation of a hypothesis, Different thought processes in developing hypothesis (analogy, induction, deduction and intuition), Hypothetico-deductive model, Testing hypothesis, Auxiliary hypothesis, *Ad hoc* hypothesis.

Theories and Laws in Science; Scientific evidences and Proofs; Peer reviews.

Importance of Models, Simulations and Virtual Testing.

III. Experimentation (6hrs)

Types of experiments; Design of an Experiment: Principles and procedures;

Necessity of units and dimensions; Repeatability and Replications; Documentation of experiments

Planning of Experiments: Design, selection of controls, Observational and Instrumental requirements, Test animals used in experiments.

IV. Ethics in Science (5hrs)

Scientific information: Depositories of scientific information – primary, secondary and digital sources

Sharing of knowledge, transparency and honesty.

Reporting of observational and experimental data, Influence of observer on observations.

Publications , Patents, Plagiarism

Section-B BIOSTATISTICS (15 Hrs)

I- Biostatistics: Definition, Scope, Role of statistics in Life Sciences, Terminology and variables .

Sample and Sampling: Sample size, Sampling errors, Methods of sampling

Specific aspects of statistical data

i) Collection / documentation of data of the experiments:

Classification and tabulation of data

ii) Presentation of data: a) Graphic representation: Histogram, Frequency Polygon and Frequency Curve

b) Diagrammatic representation: Line diagram, Bar diagram and Pie diagram

iii) Analysis of data:

(a) Measures of central tendency: Mean, Median and Mode

Standard error

iv) Interpretation:

Significance of statistical tools in data interpretation

Statistics-based acceptance or rejection of

SECTION-C INFORAMTICS (19 hours)

I. KNOWLEDGE SKILLS FOR HIGHER EDUCATION (8 hrs)

- Data, information and knowledge, knowledge management - Internet access methods - Dial-up, DSL, Cable, ISDN, Wi-Fi - Internet as a knowledge repository, academic search techniques, creating cyber presence, case study of academic websites, open access initiatives, open access publishing models. Basic concepts of IPR, copyrights and patents, plagiarism, introduction to use of IT in teaching and learning, case study of educational software, academic services - INFLIBNET, NICNET, BRNET

II.SOCIAL INFORMATICS (6 hrs)

IT & society - issues and concerns - digital divide, IT & development, the free software movement, IT industry: new opportunities and new threats, software piracy, cyber ethics, cyber crime, cyber threats, cyber security, privacy issues, cyber laws, cyber addictions, information overload, health issues-guide lines for proper usage of computers, internet and mobile phones. E-wastes and green computing, impact of IT on language and culture - localization issues - Unicode - IT and regional languages.

III. IT APPLICATIONS (very brief account of the following) (5 hrs)

e-Governance applications at national and state level, IT for national integration, overview of IT application in medicine, healthcare, law, crime detection, publishing, communication, resources disabled management, weather forecasting, education. IT in service of, futuristic IT - Artificial Intelligence, Virtual Reality, Bio-Computing.

Topics for Assignments / Seminars

1. Findings that changed the course of science.
2. Prepare a table showing the height of 20 students in a class. Calculate the mean height.
3. What are the mathematical properties of SD? How is it a better measure of dispersion than range? Calculate the arithmetic mean and the SD of the frequency distribution obtained from a sample of data.
4. Report an experimental data in tabular / graphical form.

References – GENERAL METHODOLOGY &BIOSTATISTICS

Bailey, N. T. J. (1994/95). Statistical Methods in Biology, 3e, CUP/ LPE.

- Collins, H. and Pinch, T. (1993). *The Golem: What Every one Should Know About Science*, Cambridge University Press.
- Gieryn, T. F. (1999). *Cultural Boundaries of Science*, Univ. Chicago Press.
- Green, R. H. *Sampling design and Statistical Methods for Environmental Biologists*. J.W. & S.
- Gupta, S. P. (2002). *Statistical Methods*. 31e, Sultan Chand & Co.
- Holmes, D., Moody, P. and Dine, D. (2006). *Research Methods for the Biosciences*, Oxford University Press.
- Pechenik, J. A. (1987). *A Short Guide to Writing About Biology*, Boston. Little Brown.
- Prasad, S. (2004 / '05). *Elements of Biostatistics*, Rastogi Publs., Meerut.
- Ruxton, G. D. and Colegrave, N. (2006). *Experimental Design for Life Sciences*, 2e, Oxford University Press.
- Rastogi, V. *Fundamentals of Biostatistics 2nd edition – Ane's student edition*
- Snedcor, G. W. and Cochran, W. G. *Statistical Methods*. Allied East-West Press, ND.
- Sokal, R. R. and Rohlf, F. I. *Introduction to Biostatistics*, W.H. Freeman.
- Steel, R.G.D. and Torrie, J.H. *Principles and Practice of Statistics with special reference to Biological Science*.
- Verma, B. L. *et al.* (1993). *Biostatistics*, OBS, ND.
- Victoria, E. McMillan. (1997). *Writing Papers in the Biological Sciences*, Bedford Books, Boston.
- Yadav, K. (1993). *Teaching of Life Sciences*, Anmol Pubns., New Delhi.

Useful webs

Biological methods: www.cfkeep.org/html/stitch.php?s=98965698293378 & id = 44650773279975.

Writing Papers : www.ruf.rice.edu/~bioslabs/tools/report/reportform.html

References on INFORMATICS

- Technology in Action, Pearson.
- V. Rajaraman, *Introduction to Information Technology*, Prentice Hall.
- Alexis Leon & Mathews Leon, *Computers Today*, Leon Vikas, Rs. 180.
- Peter Norton, *Introduction to Computers*, 6e, (Indian Adapted Edition), Additional References.
- Greg Perry, *SAMS Teach Yourself Open Office.org*, SAMS.
- Alexis & Mathews Leon, *Fundamentals of Information Technology*, Leon Vikas

George Beekman, Eugene Rathswohl, Computer Confluence, Pearson Education.

Barbara Wilson, Information Technology: The Basics, Thomson Learning

John Ray, 10 Minute Guide to Linux, PHI, ISBN 81-203-1549-9.

Ramesh Bangia, Learning Computer Fundamentals, Khanna Book Publisher

Web Resources

www.fgcuedu/support/office2000.

www.openoffice.org Open Office Official web site.

www.microsoft.com/office MS Office web site.

www.Igta.org Office on-line lessons.

www.learnthenet.com Web Primer.

www.computer.org/history/timeline.

www.computerhistory.org.

<http://computer.howstuffworks.com>.

www.keralaitmission.org.

<http://ezinearticles.com/?Understanding-The-Operation-Of-Mobile-Phone-Networks&id=68259>.

<http://www.scribd.com/doc/259538/All-about-mobile-phones>.

<http://www.studentworkzone.com/question.php?ID=96>.

<http://www.oftc.usyd.edu.au/edweb/revolution/history/mobile2.html>

COURSE VIII : PRACTICAL- II* C
GENERAL METHODOLOGY IN SCIENCE, BIOSTATISTICS
AND GENERALINFORMATICS

Code: ZO5B 15(P)

[36 hours] [2 hours per week] 2 Credits

Any 4 items of the following (1-7)

1. Design an experiment to prove a hypothesis by testing the specificity of the enzyme salivary amylase on starch.
2. Measure the size of given leaves / any sample of data and calculate the mean, median and mode.
3. Measure the size of given shells / any sample of data and represent it in a graphical form and interpret it.
4. Calculate the standard deviation of the given set of data.
5. Censusing of the avian fauna / any fauna of an area and present the data in a suitable graphical form.
6. Construct frequency curve, frequency polygon, bar diagram, histogram and pie diagram using suitable data.
7. Formulate a hypothesis of any scientific observation made by you.
 - Feeding rate and BMI in an insect larva.
 - Phototaxis in Earth worms.
 - Mortality of mosquito larvae on application of oil / kerosene.

SIXTH SEMESTER B.Sc .DEGREE PROGRAMME(Theory)

ZOOLOGY CORE COURSE- IX

Code: ZO6B 16T

BIOCHEMISTRY, PHYSIOLOGY AND ENDOCRINOLOGY

(54 hours) (3 hours/ week) (3 credits)

Section A: BIOCHEMISTRY (22 hrs)

1. Introduction (2 hrs)

History, scope, biomolecules (micro and macro molecules) and elements of biological importance; mention chemical bonds; Mention peculiar properties of carbon. Concept of pH and buffers. Significance of water

2. Carbohydrates (3 hrs)

Structure, classification and functions, principles of analytical techniques (qualitative and quantitative) and clinical significance of these tests; (Benedict's, Fehling's, Barford's, Selivanof's etc.) Spectrophotometry- Principle; Beer's law, Lambert's law, Beer-Lambert law, applications: Mention (i) Colorimeter (ii) Ultraviolet - visible spectrophotometer, NMR spectrophotometry

3. Amino acids and Proteins (4 hrs)

Amino acids classification and structure, Primary, Secondary and Tertiary structure of proteins, physical and chemical properties; Principles of analytical techniques such as Biuret reaction, Ninhydrin reaction, etc. and clinical significances. Separation techniques. Brief introduction to (i) Chromatography: (a) Paper chromatography (b) Thin layer chromatography (c) Column chromatography, (d) HPLC. 2. Electrophoresis: Mention (a) Polyacrylamide Gel Electrophoresis (PAGE) (b) Agarose Gel Electrophoresis

4. Lipids (1 hr)

Classification and functions (simple and compound lipids, mention lecithins, cephalins, prostaglandins and cholesterol)

5. Enzymes and co-enzymes (3 hrs)

Classification, nomenclature and properties of enzymes; mechanism and theories of enzyme action, enzyme inhibition, co-enzymes (NAD, FAD) and cofactors, and their role in enzyme action, ribozymes.

6. Nucleic acids (3 hrs)

Various types of DNA (A, B, C, D & Z) and RNA, chemical structure of purines and pyrimidines, chemical structure of nucleotides (ATP, cAMP, NAD⁺, FAD), molecular structure of B-DNA, molecular structure of tRNA.

7. Metabolism of carbohydrates, proteins and lipids (6 hrs)

Glycogenesis, glycogenolysis, gluconeogenesis, glycolysis, mention - Malate aspartate shuttle and glycerol phosphate shuttle, Krebs's cycle, Oxidation and reduction reactions, redox potentials, electrochemical gradients, electron transport chain, oxidative phosphorylation, role of cytochromes, release and storage of energy, high energy compounds, dehydrogenation of fuel molecules, proton gradient and principles and chemiosmotic synthesis of ATP; β -oxidation of fatty acids, deamination, transamination and decarboxylation of amino acids

Section B PHYSIOLOGY (24 hrs)

1. Nutrition (3 hrs)

1. Process of digestion and digestive enzymes. Absorption of nutrients, nutrition in pregnancy, infant nutrition, breast feeding, importance of fibres in food, nervous and hormonal control of digestion, ruminant digestion. Nutritional disorders - anorexia, acidity, ulcer, flatulence, starvation, fasting and its significance

2. Respiration (3 hrs)

Brief account of gaseous exchange and transport of respiratory gases different respiratory pigments, structure and properties of Hb, Neurophysiological control of respiration; physiological problems in diving mammals, newborn and aged individuals.

3. Circulation (5 hrs)

Blood constituents (normal and abnormal), agglutination and coagulation of blood (enzyme cascade theory), clinical analysis of blood, haemostasis,

haemolysis and jaundice, haemoglobinopathies, ESR, blood transfusion, aphaeresis, haemodynamics. Common cardio-vascular problems : abnormal variations in BP, tachycardia, Bradycardia, Myocardial infarction, heart failure, cerebral haemorrhage and stroke

4. Osmoregulation and Excretion (4 hrs)

Osmotic and ionic regulation in terrestrial, fresh H₂O and Marine animals; Osmoconformers, osmoregulators, H₂O retention and conservation in desert forms, types of excretion, urea cycle. Structure of human kidney and associated parts and- urine formation with countercurrent mechanism and hormonal regulation. Abnormal constituents of urine.

5. Muscle Physiology (4 hrs)

EM structure of Myofibrils and Myofilaments; contractile proteins (different types), ultra structural changes, physiology and chemistry of muscle contraction, energy sources, role of creative phosphate, coricycle, muscle twitch, fatigue, rigor mortis.

6. Nerve Physiology (4 hrs)

Different types of nerve cells, glial cells, giant nerve fibre of crustaceans and cephalopods, regeneration of medullary fibres, neurotrophins, nerve impulse transmission, synapses and neuromuscular junctions, synaptic transmission (electrical & chemical), neurotransmitters

7. Bioluminescence and Bioelectricity (1 hr)

Section C -ENDOCRINOLOGY (8 hrs)

1. Invertebrate endocrinology (1 hrs)

Neuroendocrine organs and hormones in insects and crustaceans

2. Vertebrate endocrinology (3 hr)

Classification of hormones

Endocrine glands (Pituitary, Adrenal, Pineal, Thyroid, Parathyroid, Gastro-intestinal, and Pancreas) and their hormones (brief account). Hormonal disorders.

Concepts of neurosecretion

(1 hrs)

Hypothalamus, Hypophysial interactions, Hypothalamus releasing and inhibiting hormones

Hormonal action

(3hrs)

Mechanism of hormone action at the level of cell membrane (insulin), at the level of enzyme located in cell membrane (adrenaline and peptide hormones), at the level of organelles (thyroxine), at the level of genes (steroids), positive and negative feedback regulation; Hormone receptors

Topics for assignments / seminar

1. Medical aids for respiration - aspirators, artificial respiration and ventilation, heart lung machine
2. Common renal problems - Renal hypertension, nephritis, renal failure, edema, acidosis, uraemia, haematuria and calculi
3. Brief notes on: Intelligence, memory, sleep, hunger, thirst and emotion
4. Radioactive Techniques (Principles and Applications)

REFERENCES

- Aggarwal, S. K. Foundation course in Biology, 2nd edition-Ane's Student edition
- .Arora, M. P. (2004). Biophysics, 1e, Himalay Publications
- Asha Bhate (2005). Modern Tools and Techniques. Sarup & Sons.
- Bajpai, P. K. (2006). Biological Instrumentation and Methodology, 1e, S. Chand & Company Ltd.
- Boyer, R. (2004). Modern Experimental Biochemistry, 3e, Pearson Edn.
- Bentley, P. J. Comparative vertebrate endocrinology, CUP.
- Berry, A.K., A Text book of Animal Physiology, 6e, Emkay Publications, Delhi-51.
- Chatterjee, C.C., Human Physiology, Medical Allied Agency.
- Conn, E.E. *et al.* Outlines of Biochemistry, 5e, 2001, John Wiley & Sons.

Ganong, W.F., Lange Review of Medical Physiology, 20, Indian Edn., 2002, MGH.

Gorbman, A. *et al.* Comparative Endocrinology, JW & S.

Guyton, A.C., Hall, J.E.: Text book of Medical Physiology, IOC, Harcourt.

Plumme D., Practical Biochemistry

Hadley, M.E., Endocrinology, 5e, 200, Pearson Edn. (Singapore), ND.

Highnam & Hill: Invertebrate Endocrinology.

Hoar, W.S.: General and Comparative Animal Physiology. 1975, PHI.

Mathews, C.K. *et al.*, Biochemistry, 3e, 2003, Pearson Edn. (Indian Edn.).

Nelson, D.L. & Cox, M.M., Lehninger Principles of Biochemistry, 4e, Palgrave MC, WHF.

Oser, B., Hawk's Physiological Chemistry, 14e, 1971, TMH.

Turner, C.D. General and Comparative Endocrinology.

Vander, A.J. *et al.* Human Physiology, 1998, MGH.

Voet, D. & Voet, J.G., Biochemistry, JW & S.

Williams, R.H., Text book of Endocrinology, W.B. Saunders.

David P. Plummer - Introduction to Practical Biochemistry, 3rd edn., Tata McGraw Hill Pub. Comp., New Delhi.

Nielsen – Animal Physiology – Cambridge University Press.

Wilson and Walker – Principles and Techniques of Biochemistry and Molecular Biology, 6th edition – Cambridge Low Price edition.

CORE COURSE IX: PRACTICAL III*-A
BIOCHEMISTRY, PHYSIOLOGY AND ENDOCRINOLOGY

Code: ZO5B 17(P)

(36 hours) (2 hours per week) 2 credits

1. Qualitative Tests for mono, di and polysaccharides (reducing and nonreducing) (major)
2. Qualitative Tests for protein
3. Qualitative Tests for lipids
4. Abnormal constituents of urine (glucose and albumin) (major)
5. Determination blood clotting time (Demo)
6. Determination of blood pressure (Demo)
7. Determination of Hb content in man using Haemoglobinometer (Demo)
8. Determination of body mass index (individuals)
9. Separation of amino acids (or any other compounds) from a mixture by using paper chromatography (demonstration)
10. Determination of concentration of unknown solutions using photocolormeter (demonstration)

References:

- Michael, P. (1986). Ecological Methods for Field and Laboratory Investigations. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
- Patki, L. R., Balchandra, B. L. and Jeevaji, I. H. (1983). An Introduction to Microtechnique, S. Chand & Co. Ltd.
- Piramal, V. (2005). Biophysics. Dominant Publs. and Distributors.
- Plummer, D. T. (1995). An Introduction to Practical Biochemistry, 3e, Tata Mc Graw-Hill Publ. Co. Ltd., New Delhi.
- Roy, R. N. (2005). A Text Book of Biophysics. New Central Book Agency, Pvt. Ltd.
- Sawbney, S. K. and Singh, R. (eds.) (2001). Introductory Practical Biochemistry, Narosa.
- Verma, P. S. and Agarwal, V. K. (1985). Principles of Ecology. S. Chand & Co. Ltd., New Delhi.

SIXTH SEMESTER B. Sc. DEGREE PROGRAMME(Theory)

ZOOLOGY Core Course-X

Code: ZO6B 18T

MOLECULARBIOLOGY & BIO INFORMATICS

[54 hours] [3 hours per week] [3 credits]

Section- A MOLECULAR BIOLOGY (27 hours)

- 1. Introduction (4 hrs)**
DNA as the genetic material.Griffith's experiments-Bacterial transformations-Experiments by Hershey and Chase. Concept of gene- Gene action / gene expression: one gene – one enzyme hypothesis, one gene – one polypeptide hypothesis; central dogma of molecular biology and central dogma reverse; retroviruses.
- 2. Repetitive and unique DNA sequences (2 hrs)**
Chromosome content – C-value and C-value paradox, unique, moderately repetitive and highly repetitive DNA sequences – Satellite DNA – selfish DNA
- 3. Genetic code (4hrs)**
Gene and genetic code, deciphering / cracking of genetic code; contributions of 1) Nirenberg and associates, 2) Khorana; properties of genetic codes, codon assignments, wobble hypothesis
- 4. Mitochondrial genome (2hrs)**
- 5. Protein synthesis: (4 hrs)**
Regulation of Protein synthesis – Role of RNAs
synthesis of mRNA – promoter, enhancer and silencer sites – post transcriptional modifications – cis-trans splicing – spliceosomes – hn RNAs – activation of Amino acids – Polypeptide chain initiation, elongation and termination – release – Ribozymes – post translational modifications – coupled transcription and translation – poly cystronic mRNA – role of molecular chaperons – cell targeting proteins (brief account only).

6. Regulation of gene action: (4hrs)

In prokaryotes [operon concept, Lac operon in detail], lytic cycle and lysogeny of phages [brief account] siRNA and RNAi, House keeping genes, gene modulation.

7. Organization of genome (5 hrs)

Classical concepts of genes. Modern concept of genes – cistron, muton, recon, complicon, transcripton; split genes, overlapping genes, pseudo genes, jumping genes, cryptic genes [brief accounts only]

8. Human genome project (2hrs)

Significance – ethical, social and legal issues

Section- B BIO INFORMATICS (27 hours)

I. Overview of Bioinformatics (2 hrs)

Introduction: Definition, history, development and scope, tasks

II. Major databases in Bioinformatics (5 hrs)

a) Primary databases:

Nucleotide sequence databases – Mention EMBL, DDBJ, Genbank

Protein sequence databases – Mention Swiss Prot, PIR, MIPS

Metabolite databases – Mention KEGG, EcoCyc

b) Secondary databases: Mention PROSITE, PRINTS, Blocks

III. Database Search Engines (4hrs)

Mention Entrez at NCBI of USA, SRS at EBI of England, STAG at DDBJ of Japan

IV. Sequence Similarity Search (3 hrs)

Pairwise sequence alignment: Mention BLAST, FASTA, Multiple
sequence alignment: Mention CLUSTAL W, CLUSTAL X

V. Micro arrays	(2 hrs)
Data analysis tools and methods	
VI. Genomics	(3 hrs)
DNA sequencing, applications (Brief account)	
VII. Proteomics	(2 hrs)
Tools and applications (Brief account)	
VIII. Metabolomics	(2hrs)
Tools and applications (Brief account)	
IX. Applications of Bioinformatics	(2 hrs)
X. Ethical issues in Bioinformatics	(2hrs)
sAccuracy and error	
a. Appropriate uses and users	
b. Privacy and confidentiality	

References:-Molecular biology: Alberts, B. *et al. Molecular Biology of the Cell.* Garland Pubg. Inc., New York.

Bhaskaran, K.K. & Biju Kumar, A.: *Cell Biology, Genetics & Molecular Biology.* Manjusha.

Brooks, R. J.: *Genetics: Analysis and Principles.* 1999, Addison Wesley

Burns, G. W. & Bottino, P. J.: *The Science of Genetics.* 6/7e, Maxwell McMillan

Darnell, J. *et al.:* *Molecular Cell Biology.* Scientific American Book

De Roberties, E. D. P. *et al.:* *Cell and Molecular Biology* TMH

Dobzhansky, Th.: *The Genetics and Origin of Species.* Columbia Uty. Press

Freifelder: *Molecular Biology.* Narosa Pubg. House, N. D.

Gangane, S. D.: *Human Genetics.* 2e, 2000, B. I. Churchill Livingstone, N D.

Gerlad Karp: *Cell and Molecular Biology.*

Good Enough, U.: *Genetics.* Halt, Reinharts & Winston

Gupta, P. K.: *Cell and Molecular Biology*, 2e, 2002, Rastogi Pubs., Meerut.

John Ringo: *Fundamental Genetics*- Cambridge University Press.

Kleinsmith, L. J. & Kish, V. M.: *Principles of Cell and Molecular Biology*. 2e, 1995, Harper Collins College Pubs

Lewin, B. *Genes IX edition*. OUP

Mange, E. J. & Mange, A. P.: *Basic Human Geneics*. 1999. Indian edn. Rastogi

McCusik, V. A.: *Human Genetics*. PHI.

Micklos, D. A. & Freyer, G. A.: *DNA Science*. 1990, Cold-Spring Harbour Lab Pre

Primrose, S. B. *et al.*: *Principles of Gene Manipulation*, 6e, 2000, Blackwell Science.

Ricki, L.: *Human Genetics: Concepts and Applications*. WCB MGH

Red: *New Clinical Genetics*.

Robert H. Tamarin, *Principles of Genetics*.

Roy, R. N.: *Medical Biophysics*, 1e, 2001, Books & Allied, Calcutta

Sharma, A. K. & Sharma, A.: *Chromosome Techniques*. 1990, Butterworth

Sharma, A., *Chromosomes*. 1992, Oxford & IBH

Sharma, B. K.: *Instrumental Methods of Chemical Anlasis*. Goel Pub House

Sinnott, E. M. *et al.* *Principles of Genetics*, 1958, MGH

Snustad & Simons: *Principles of Genetics*. 1997, JW & S

Stine, C. J.: *The New Human Genetics*, W.C. Brown

Strachan, I. & Read, A.P.: *Human Molecular Genetics*. 1999, JW & S

Strickberger: *Genetics*, 4e, W.C. Brown Pub., Maxwell Macmillan.

Vijayakumaran Nair, K. & Jayaprakash, M.: *Cell Biology, Genetics, Molecular Biology*. Academica, TVM.

Watson, Baker, Bell, Gann and Levin, *Molecular Biology of Genes*.

Watson, J.D. *et al.*, *Molecular Biology of the Gene*, 4e, Benjamin Cummings

Weaver, H.: *Genetics*. 1997, W.C. Brown

Winchester, A.M.: *Genetics*, 3e, 1966/6790, Oxford & IBH.

Vides, *Integrative Approach to Molecular Biology*, MIT Press

Vides, *Gene Regulation and Metabolism*, MIT Press

Potchard, *Medical Genetics at a Glance*, Blackwell

Jan Vijg, *Aging of the Genome*, Oxford University Press

Frank H. Stephenson, *Calculations for Molecular Biology and Biotechnology: A guide to Mathematics in the Laboratory*, Academic Press, Elsevier

References:Bioinformatics

Atwood and Parry-Smith. 2001. *Introduction to Bioinformatics*. Pearson Education Asia, New Delhi.

Baxevanis & Ouellette. 2001. *Bioinformatics - A practical guide to the Analysis of Gdnes and Proteins*, Wiley, New York.

Mount, 2001. *Bioinformatics: Sequence and Genome Analysis*. Cold Sprint Harbour laboratory Press, New York.

S.C. Rastogi, Mendiratta, P. Rastogi. 2005. *Bioinformatics: Method & Applications*. Genomics, Proteomiocs & Drug Discovery. Prentice Hall of India, New Delhi.

Mani & Vijayaraj. 2004. *Bioinformatics: A Practical Approach*. Aparna Publications, India.

Higgins and Taylor. 2000. *Bioinformatics: Sequence, Structure and Databanks*. Oxford University Press, Oxford.

Jin Xiong. 2006. *Essential Bioinformatics*. Cambridge University Press, India Pvt. Ltd.

Rex A. Dwyer - *Genomic Peril - From Bioinformatics Basics to Working Code (with CD)* - Cambridge University Press. Atwood and Parry-Smith. 2001. *Introduction to Bioinformatics*. Pearson Education Asia, New Delhi.

www.fgcuedu/supp

SIXTH SEMESTER B. Sc. DEGREE PROGRAMME(Theory)

ZOOLOGY Core Course XI

Code: ZO6B19 T

**REPRODUCTIVE BIOLOGY, DEVELOPMENTAL BIOLOGY AND
TERATOLOGY**

(54 Hours) (3 hours per week, 3 credits)

Section A: REPRODUCTIVE BIOLOGY (14 hrs)

- 1. Introduction (1 hr)**
Scope, reproductive strategies in invertebrates and vertebrates: semiparity and iteroparity, sex patterns: unisexual, reversal of sex, examples.
- 2. Reproductive system in human beings (3 hrs)**
Male reproductive system: Structure of testis, Semen production and composition, Ejaculation; Female reproductive system: Structure ovary and Graafian follicle, ovulation, mention corpus haemorrhagicum, corpus luteum and corpus albicans; Accessory reproductive organs ; secondary sexual characteristics. Gametogenesis male and female
- 3. Pregnancy, Gestation, Placentation, parturition and lactation (2 hrs)**
- 4. Reproductive cycles in Mammals (2 hrs)**
Oestrous and menstrual cycles and their hormonal control
- 5. Reproductive technologies (1 hr)**
Infertility and its management: Brief account of semen collection, preservation, storage, artificial insemination, surrogacy.
- 6. Cryopreservation and embryo transfer (1 hr)**
Collection, care and preservation of embryos; *In vitro* fertilization and embryo transfer : major steps; Test tube babies
- 7. Assisted Reproductive Techniques (ART) (1hr)**
GIFT, ZIFT, ICSI, oocyte donation and embryo donation

8. Prenatal Diagnosis (1 hr)

Different methods (invasive and non invasive). Female foeticide: ethical issues and law. (Mention Prenatal Diagnostic techniques – Prevention of misuse act – PNDT Act)

9. Fertility Control (2 hr)

Natural methods, Artificial methods, chemical methods, hormonal methods, surgical contraception, removal of gonads and uterus , abortion.

Section B: DEVELOPMENTAL BIOLOGY (38 hrs)

1. Introduction (1 hr)

Historical Perspective, Theories of Preformation, Epigenesis, Recapitulation and Germplasm, Determinate and Indeterminate types of development, Germ layers and Derivatives.

2. Types of eggs (2 hrs)

Classification of eggs based on: the amount of yolk (micro, meso & macrolecithal), the distribution (iso, centro & telo lecithal), presence or absence of shell (cleidoic & non cleidoic), the development (determinate & indeterminate) with examples; egg membranes (primary, secondary and tertiary)

3. Cleavage and cell lineage (3 hrs)

Types of cleavage with examples: based on planes (Meridional, Vertical, Equatorial and Latitudinal); based on amount of yolk (Holoblastic & Meroblastic); based on development (Determinate & Indeterminate); based on Pattern (Radial & Spiral); Cell lineage studies in Planocera; Different types of blastulae.

4. Early development of Amphioxus (3 hrs)

Cleavage, Blastulation, Gastrulation & Neurulation.

5. Development of Frog (7 hrs)

Fertilization, Cleavage, Blastulation & fate map, Gastrulation (Morphogenetic movements) and formation of germ layers, neurulation & notochord formation, mesoderm and coelom formation; organogeny of brain and eye; hormonal control of amphibian metamorphosis.

6. Development of Chick (6 hrs)

Fertilization, Structure of egg; cleavage, blastulation, gastrulation and formation of germ layers; Salient features of chick embryo at primitive streak stage, 24 & 33, 48 hours stage; Development and functions of extra embryonic membranes.

7. Development of Man (2 hrs)

Cleavage and formation of morula, development of blastocyst, implantation, gastrulation up to the formation of germ layers.

8. Cell Differentiation and Gene action during development (4 hrs)

Cell differentiation, totipotency, pluripotency, Dedifferentiation and Redifferentiation; controlled gene expression during development, Homeotic genes, Mention Hoxgenes; Stem cells, their significance and applications .

9. Regeneration (2 hrs)

Definition, Types (Epimorphosis, Morphallaxis, Heteromorphosis, Super regeneration)), Histological and Physiological events in regeneration in general, mention factors affecting regeneration

10. Parthenogenesis (2 hrs)

Definition, Types: i).Natural parthenogenesis: Arrhenotoky, Thelytoky, Obligatory and Facultative, ii). Artificial parthenogenesis, and significance

11. Experimental Embryology (4 hrs)

Construction of fate map, Vital staining, Marking with carbon particles & radio active tracing; Spemann's constriction experiments on amphibian embryos (Potency of nuclei and grey crescent), Importance of Grey crescent; Organizers in amphibian development (primary, secondary & tertiary organizers); Gradient experiments in sea urchin eggs).

Section C: TERATOLOGY (2 hrs)

Environmental disruption of animal development (alcohol, drugs, Nicotine and chemicals- brief account) [Refer Developmental Biology, Scott F. Gilbert].

Topics for Seminar / Assignment/Discussion

1. Parenta: different types and functions

2. Development of foetal membranes in man.
3. Regeneration in animals.
4. Factors affecting regeneration
5. Factors inducing parthenogenesis.

References

- Agarwal, P., *Chordate Embryology and Histology*, 1e, 2001, Krishna Prakashan
- Balinsky, B.I. *Embryology*, Saunders & Topan
- Bejley, D.J. *et al.*, *Human Reproduction & Developmental Biology*, 1980, McMillan
- Berril, N.J. & Karp, G. *Development* TMH.
- Gilbert, S.C., *Developmental Biology*, 5e, Sinauer Associates.
- Jayaprakash, M. *A Manual of Developmental Biology*, 2e, Academia, Trivandrum.
- Patten, B.M.: *Early Embryology of the Chick*, 1973, TMH.
- Patten, B.M.: *Foundations of Embryology*, 1958, McGraw Hill.
- Rugh, R.: *Frog Reproduction and Development*.
- Sastry & Shukul: *Developmental Biology*, 2003, 1e, Rastogi Pub.
- Scott, F., Gilbert: *Developmental Biology* – Sinaur Associates.
- Verma, P.S. & Agarwal V.K.: *Chordate Embryology*.
- Vijayakumaran Nair, K. & George P.V. *A Manual of Developmental Biology*, 3e, 2002.
- Wolpert, L.: *Principles of Development*, 1994, OUP.
- Muller, *Developmental Biology*, Springer Publishers.

CORE COURSE XI: PRACTICAL III*B

Code: ZO6B 20(P)

REPRODUCTIVE BIOLOGY AND DEVELOPMENTAL BIOLOGY

(36 hours) (2 hours per week) (2 credits)

1. Demonstration of chick blastoderm
2. Induced ovulation in fish
3. Study of life cycle in *Drosophila*

Spotters

Types of eggs (Insect, amphioxus, frog, chick, and human)

Cleavage in frog (use slides / diagrams/models)

Shark - Yolk sac placenta

Frog- Blastula, gastrula, neurula

Chick – 18, 24, 32, 48 hours of incubation

Mammal - Any two mammalian embryos

Larval forms of invertebrates (any five) and vertebrates (any two)

SIXTH SEMESTER B. Sc. DEGREE PROGRAMME(Theory)

ZOOLOGY Core Course XII

Code: ZO6B 21T

BIOTECHNOLOGY, MICROBIOLOGY AND IMMUNOLOGY

(54 hours) (3 hours per week) (3 credits)

Section- A BIOTECHNOLOGY (18 hrs)

1. **Definition and brief introduction of Biotechnology** – Mention branches of Biotechnology (brief). **(2 hrs)**
2. **Fundamentals of animal cell culture and hybridoma technology:** Primary cell culture, secondary culture, types of cell lines, valuable products from cell culture, hybridoma technology, monoclonal antibodies and uses **(3 hrs)**
3. **Gene cloning and DNA sequencing:** Introduction, cloning vectors (plasmid, pBR322, phages, cosmids, virus, YAC), Enzymes of rDNA technology (Exonuclease, Endonuclease, Restriction enzyme, DNA ligase, DNA polymerase, Reverse transcriptase)
Use of Linkers
Construction of Recombinant DNA, DNA sequencing (brief) **(4 hrs)**
4. **Transgenic organisms:**
 - (a) Transfection methods: Calcium phosphate precipitation, Dextran mediated, Lipofection, Electroporation, Retroviral infection, micro injection, Shotgun method (brief)
 - (b) Transgenic animals: Fish, sheep, rabbit, mice, and goat. 1 example from each
 - (c) Molecular pharming and bioreactors
 - (d) Mention knock out mice, Bt cotton **(3 hrs)**
5. **Molecular markers** – RFLP, RAPD, VNTR Micro satellites or STR, and their uses.
Chromosome walking

Fluorescence in situ hybridization (FISH) and DNA Finger printing (Profiling) techniques (3 hrs)

6. Biotechnology and Environment:

Biosensors, Bioremediation – Ex situ and in situ

Biofiltration , Bioleaching (microbial mining) (2hrs)

7. The ethical and social implications of genetic engineering. (1 hr)

Section-B MICROBIOLOG Y (18 hrs)

1. Introduction and scope of microbiology. (1 hr)

2. Survey of Microorganisms (outline only) (3 hrs)

Prions, Viroids, Viruses, Rickettsias, Mycoplasmas, Bacteria, Cyanobacteria, Prochlorophyta, Protozoa, Algae, Fungi and Slime moulds

3. Structure of a typical bacterium: (3 hrs)

Characteristics and major groups of bacteria, growth phases, measurement of growth

4. Viruses: Structure and shape (2 hrs)

5. Basic methods in Microbiology: (4 hrs)

Microscopic methods, Techniques of sterilization, Media preparation, Isolation and inoculation, Direct observation and Staining techniques, Maintenance and preservation of cultures

6. Microorganisms in Industry: (2 hrs)

Products of industrial fermentations, Citric acid, Lactic acid, Amino acids, Enzymes, Vitamins, Antibiotics, Single cell protein, Steroids etc.). Effects of environment on microbial growth (Temperature, Atmosphere, pH and Osmotic factors

7. Microorganisms in Human Diseases: (3 hrs)

Normal micro flora of the human body, Diseases caused by Bacteria,

Protozoa, Virus (brief). Epidemiology and control of diseases,

chemotherapy

Section-C IMMUNOLOGY(18 hrs)

- 1. Introduction and History (2 hrs)**
Immunity – Natural and Acquired, Active and Passive, Immunisation, Vaccines Principles of vaccination, Attenuated bacterial or viral vaccines, inactivated viral or bacterial vaccines, Toxoid vaccines.(brief).
- 2. Immune System (2hrs)**
Cells and organs of the immune system.(B- lymphocytes,T-lymphocytes,NK cells,Phagocytesmonocytes,macrophages,Neutrophils,Basophils,Eosinophils, Mastcells,Dendriticcells,-Organs-Spleen,Thymus,Bonemarrow,and Lymphnodes
- 3. Structure and classes of immunoglobins, their biological functions. (1 hrs)**
- 4. Antigens: (2 hrs)**
Types, Immunogenecity, Exogenous antigens, Endogenous, adjuvants, haptens, Epitopes, Antigen-antibody rection.- Precipitation reaction, Agglutination reaction, Agglutination inhibition reaction.
- 5. Humoral and cellular immunity, interferons, cytokines (1 hr)**
- 6. Major Histocompatibility Complex- (2 hr)**
MHC, HLA (Human Leucocytic Antigen), Class I and Class II MHC molecules and their structure
- 7. Immunodeficiency diseases (2hrs)**
AIDS- Structure of HIV virus, Clinical course of HIV-Acute infection, sero conversion, Window period, Chronic latent phase-lymph adenopathy, Crisis phase-Full blown aids, Antiretro viral therapy
- 8. Autoimmune diseases: (1hr)**
(systemic-Eg.SLE, Multiple sclerosis and Rheumatoid arthritis - organ specific-Eg-Hashimoto’s thyroiditis, Grave’s disease and Myasthenia gravis)
- 9. Techniques in Immunology : (3 hrs)**
(Principles and Applications of)
(i) Immuno assays: RIA, ELISA and Flow cytometry

(ii) PCR

(iii) Blotting techniques: (a) Southern blotting (b) Northern blotting
(c) Western blotting; Mention dot blots and slot blots; DNA finger printing and
DNA foot printing

10. Tumour immunology: (2 hrs)

Malignant transformation of cells, tumour antigens, immune response to tumour-Effector mechanisms in antitumor immunity-a) Antibodies b) T.lymphocytes c) NK cells d) Macrophages, Immunotherapy

Topics for Assignment / Seminar

1. Gene therapy
2. Biofertilizers and Biopesticides
3. Organ transplantation.
4. Genetically engineered microorganisms and their applic
5. Hyper sensitivity- I

References

- R. C. Dubey, A text book of Biotechnology, S. Chand & Co.
Benjamin Lewin – Genes, Vol. IX.
Old and Primrose – Molecular Cloning.
L.P. Rema – Applied Biotechnology – MJP Publishes.
R.C. Sobti and S. Pachauri – Essentials of Biotechnology – Ane books Pvt. Ltd.
B.D. Singh – A text book of Biotechnology, Kalyani Publishers.
Pelezar, M.J., Reid, R.D. and Chan, E.C.S., Microbiology, TMH.
Kuby, J., Immunology, W.H. Freeman.
Joshy K.R. Immunology – Agro Bios.
Ananthanarayan & Paniker, J. Microbiology Orient Longman.
A.S. Rao, Introduction to Microbiology, Prentice Hall of India.

Hans G. Schiegl – General Microbiology, Cambridge University Press.

Heritage, Evans and Killington – Introductory Microbiology – Cambridge University Press.

Kanika Sharma – Manual of Microbiology tools and techniques – Ane Books Pvt. Ltd.

Dominic W.C. Wong – The ABCS of gene cloning – Springer International Edn.

Veerbala Rastogi – Fundamentals of Molecular Biology, Ane Books Pvt. Ltd.

Colin Ratledge and Bjorn Kristiansen – Basic Biotechnology, Cambridge University Press.

John Smith – Biotechnology, Cambridge University Press.

Wise – Immunology – Blackwell Publishers.

Todd – Lecture notes on Immunology – Blackwell Publishing.

Monica Cheesbrough, District Laboratory Practice in Tropical Countries, Part I and II, Cambridge Low Price Editions.

Nicholl – An Introduction to Genetic Engineering – Cambridge University Press.

Wise – Immunology a Comprehensive Review – Ane Books.

Alphey – DNA Sequencing – Bios Scientific Publishers.

Hardin – Cloning, gene expression, and protein purification – Oxford University Press.

Gandhi – Microbiology and Immunology notes and cases – Blackwell Publishing.

N. Ahmed, Qureshi and Khan – Industrial and Environmental Biotechnology, Horizon Press.

Mansi – Fermentation, Microbiology and Biotechnology, Second Edition.- Taylor and Francis

Wise,- Bioinstrumentation and Biosensors - Taylor and Francis.

CORE COURSE XII: PRACTICAL III*C

Code No:ZO6B 22(P)

**BIOTECHNOLOGY, MICROBIOLOGY, IMMUNOLOGY , MOLECULAR
BIOLOGY & BIOINFORMATICS**

(36 hours) 2hours per week (2 credits)

1. Staining of bacterial cell using appropriate bacterial stain. *Lacto bacilli*
2. Staining of root nodule Nitrogen fixing bacteria. *Rhizobium*.
3. Identification of motile bacteria by hanging-drop method. (Demonstration).
4. Preparation of culture media for bacteria. (Synthetic Media, Natural Media, Simple Media, Differential Media, Selective Media,
5. Study of microbial byproducts. (Antibiotics, Milk products)
6. Identification of human blood group (A B O and Rh)
7. Prepare human blood smear to study the immunologically significant cells.
8. Study of transgenic animals.
9. Study of the principle and applications of Electrophoretic apparatus.
10. Study of the principle and applications of DNA finger printing.
11. PCR-Principle and applications.
12. ELISA-Demonstration.
13. Sequence Similarity Search using BLAST -Demonstration

Project work, Study tour / Field study, Viva-voce

Total credit	-	4
Internal weightage		5 (3+1+1)
External weightage		25(15+5+5)

PROJECT WORK Code No: [ZO6B 25(Pr)] – V&VIth SEMESTER (FOUR CREDITS)

Students are required to undertake project work on problems pertaining to biological science of 72 hrs duration (Vth & VIth Semester). Scientific study on the topic selected is required to be carried out under the supervision and guidance of faculty members. A group consisting of not more than 12 students can undertake a particular project. Each student has to actively participate in the project work.

The problem/ topic chosen by an earlier batch of students for their project work shall not be repeated by a latter batch. A certificate to this effect has to be attached by the Head of the department.

A well documented project report duly attested by the supervising teacher and the Head of the Department must be submitted by *each candidate* for evaluation separately on the day of practical examination during VIth semester. The project must contain the following sections.

1. Introduction and objectives of study. (This part may contain citations of relevant literature in the field, if available)
2. Methodology
3. Interpretation of results
4. Reference

Field Study / Study Tour (One credit)

A field study/study tour of 5 days is compulsory during the tenure of the programme. A total of atleast 3 days should be kept apart for visiting places of biological interest. One day trip should be associated with a site of ecological importance and one day trip should be associated with Elective course chosen. A detailed tour report certified by the teacher in charge of study tour and also

by the Head of the Department regarding the field study/study tours specifying the places and institutions visited, date and time of visit, details of observations made etc. must be submitted by each student in "**hand written**" mode for evaluation during the day of practical examination of VIth semester. The study tour report is compulsory for each student appearing for practical examination.

Viva-Voce (One credit)

At the end of VIth semester each student shall appear for a viva-voce before a team of two external examiners. It will be conducted on a separate day for all candidates of the centre concerned. The questions will be based on basic biological concepts, reports on project work and field study. It shall not normally exceed 10 mts per candidate. Credits shall be given according to their performance.

There shall be an internal viva-voce for one credit.

SYLLABUS
OPEN COURSES
ZO5D 01 , 02 & 03

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME(Theory)

ZOOLOGY OPEN COURSE- I

Code: ZO5D 01T

REPRODUCTIVE HEALTH AND SEX EDUCATION

(54ours) (3 hours per week) (3 credits)

1.Introduction (1 hrs)

Reproductive rights, Need for sex education

2.Sex determination and Chromosomal anomalies (5hrs)

Chromosomal mechanism of sex determination, Environmental control of sex determination, Hormonal control of sex determination, Barr body, Twin studies, Sex reversal, Sex chromosomal anomalies:Turner's syndrome and Klinefilter's syndrome.

3.Human Reproduction (15hrs)

Male reproductive system: Structure of testis, male accessory organs, Spermatogenesis, Semen production and composition, Ejaculation; Female reproductive system: Oogenesis, Structure of Human ovary, Development of primary follicle, Structure of Graafian follicle, Fallopian tubes, Uterus, Vagina, The external genitalia, Mammary glands; Menstrual cycle, Fertilisation, Implantation, Pregnancy, Gestation, Placenta, Parturition, Lactation and its hormonal control. Puberty, Precocious puberty, Menarche, Menopause, Andropause.

4.Adolescence (1hr)

Stages of sexual growth, Adolescent problems.

5.Sexualabuses and myths (4hrs)

Premarital and extramarital sex, Sexual abuse and rape, Sexual perversions, Alternate orientations (Homosexuality, Lesbianism, Bisexuality Paraphilias), Oral sex, Animal sex, Cyber sex, Child abuse, Prostitution, Sexual myths, Sexual hygiene.

- 6. Prenatal Diagnosis (2hrs)**
 Different methods (invasive and non invasive). Female foeticide: Ethical issues and laws. (Mention Prenatal Diagnostic techniques – Prevention of misuse act – PNDT Act)
- 7. Fertility Control (4 hrs)**
 Natural methods, Artificial methods, Contraceptive devices and medications, Abortion, Legal termination of pregnancy, Vasectomy, Tubectomy, Vaccines and hormones in fertility control.
- 8. Infertility and assisted reproductive technologic (5hrs)**
 Physiological infertility, pathological infertility, causes and problems in male and female infertility. Assisted Reproductive Technologies (ART) – IVF, ET, AI, GIFT, ZIFT, ICSI, Embryo or oocyte donation, health hazards in ART, cryopreservation of blastocysts and ethics, designer baby and ethics.
- 9. Sexually transmitted infectious diseases (6hrs)**
 Symptoms, mode of transmission, diagnosis, treatment and prophylaxis of AIDS, Syphilis, Gonorrhoea, Herpes (genital), human papilloma virus and genital warts, hepatitis, gonococcal vulvo vaginitis, Trichomonal vaginitis. Mention the term venereal disease. Socio economic dimensions of STD.
- 10. Ethical aspects of sex (5 hrs)**
 Introduction, Healthy relationship with opposite sex, Role of counseling, Gender discrimination in family and society, Sperm bank, Ovum bank, DNA finger printing, Paternity tests, Legal aspects of sex: Mention Acts and laws related, Woman commission and other statutory bodies.
- 11. Common diagnostic techniques (6 hrs)**
 Imaging techniques and purpose of imaging – Angiography, CT scanning, MRI, PET, and Ultra sound scanning.
 Techniques to monitor body vital functions – EEG, ECG, LFT.
 Laboratory diagnostic methods – ELISA, WESTERN BLOT.
 Therapeutic methods – Endoscopies, Laser microscopy, haemodialysis, bypass surgery, angioplasty.

. Topics for Assignments and Seminars

1. Sexual counseling.
2. Population explosion and birth control

References

1. Prakash Kothari : *Common sexual problems and solutions*, UBS Publishers and Distributors Ltd.
2. Kinsey, sex and fraud, Judith, Edward W. Eichel, John H. Court and J. Gordon, Editors Lochinvar : Huntington House Publications.
3. Lynn L. Long, Judith A. Burnett, R. Valorie Thomas: *Sexuality counseling An integrated approach* , Pearson, Merrill Prentice Hall.
4. Robert T. Francoeur: *Becoming a sexual person*, John Wiley and Sons.
5. Guyton & Hall: *Textbook of Medical Physiology*
6. Churchill Livingstone : *Davidson's Principles and Practice of Medicine*.
7. Vander, Sherman and Luciano : *Human Physiology*, McGraw Hill.
8. Vijayakumaran Nair, K.and Paul, P.I: *Animal Physiology and Biochemistry*,

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME(Theory)

ZOOLOGY OPEN COURSE II

Code: ZO5D 02T

NUTRITION, HEALTH AND HYGIENE

(54 hours) (3 hours per week) (3 credits)

Section-A. NUTRITION (18 Hours)

1. Introduction
2. Components of food, classification of foodstuffs, Balanced diet.
3. Dietary recommendations to a normal adult, infant, pregnant woman and aged.
4. Malnutrition disorders.
5. Significance of breast feeding.
6. Importance of fibers in food.
7. Food toxins, food adulteration, food processing and preservation.
8. Defects of modern food habits, mention food additives
9. Nausea, Vomiting, diarrhea, Constipation, piles, anorexia, starvation, acidity flatulence, ulcer
10. Fasting and its significance.
11. BMI and its significance.
12. Different feeding habits: vegetarians, non-vegetarians and vegans
13. Human digestive system.

Section-B. HEALTH and HYGIENE (36 Hours)

1. The need for health education (1 hr)
2. Factors influencing health (1 hr)

3. Physical health, psychological health, sociological health, Genetic influence on health, overcoming environmental influences. Three elements of health programmes: environment-education-surveillance (2 hrs)
4. Consumerism and health, Health products. (1 hr)
5. Fitness-body conditioning, principles of exercise programmes, sports, use of leisure time. (1 hr)
6. Alcoholism: Alcoholic beverages, physiological effects of alcohol, abuse of alcohol, treatment of chronic abuse of alcohol; Smoking: rights of non smokers, composition and effects of tobacco smoke, the smoking habits (active and passive smoking), legislation; Drug addiction. (4hrs)
7. Familiarization of various diseases and disorders of human body.
 - a. Communicable and non-communicable diseases (brief account) : (2 hrs)

Bacterial, viral, fungal, protozoan, helminth
 - b. Parasites and their diseases (life cycle not expected):

Mode of infection, pathogenecity, diagnosis, treatment and prophylaxis of *Entamoeba histolytica*, *Taenia solium*, *Schistosoma haematobium*, *Ancylostoma duodenale*, *Wuchereria bancrofti*, *Enterobius vermicularis*

(4hrs)
 - c. Vector borne diseases and their control:

Anopheles, *Culex*, *Aedes*, *Xenopsylla*, *Cimex*, *Pediculus* (name of any 2 diseases transmitted by the above vectors (6 hrs)
 - d. Disorders of blood vascular system: Hypotension and hypertension, coronary thrombosis, cerebral thrombosis, stroke, arteriosclerosis, atherosclerosis, angina pectoris, myocardial infarction, ischemia, sickle cell anaemia; mention ECG, EEG, pace maker, heart lung machine, angioplasty, bypass surgery. (5 hrs)
 - e. Disorders of respiratory system: COPD, crib death, asthma, bronchitis. (1hr)
 - f. Disorders of excretory and reproductive system: nephritis, UTI,

- vulvo vaginitis, STD (1 hr)
- g. Cancer, hepatitis, jaundice, diabetes type I and II, insulinoma, hyperinsulinism, Aids (brief account) (2 hrs)
- h. Early intervention in autism, dyslexia and mental retardation. (1 hr)

8 .First aid

Snake bite (add a note on identification of poisonous and non poisonous snakes from the bite mark and observing the snake, mention Haemotoxic and neurotoxic venom, anti venom, poly venom (preparation); dog bite; Scorpion/ bee/ wasp sting; burns, road accidents, drowning. (2 hrs)

9 .Proper use of drugs-ill-effects of self medication. (1 hr)

10. Hygiene : Hygiene and health factors at home, personal hygiene, Oral hygiene and sexhygiene. (1 hr)

Topics for Assignments and Seminars;

1. Vitamins, hypovitaminosis, hypervitaminosis
2. Substance abuse (alcohol, tobacco, resins, solvents, narcotics)
3. Blood pathology: anaemia, polycythemia, leucocytosis, leucopaenia, leukemia.
4. Genetic disorders, mental illness, rehabilitation.
5. Drug abuse in sports and athletics.

References

1. Gibney, *Public Health Nutrition*, Blackwell.
2. Gibney, *Clinical Nutrition*, Blackwell.

3. Sarada Subramanyam and K. Madhavankutty, *Textbook of Human Physiology*.
4. Churchill Livingstone, *Davidson's Principles of Practice of Medicine*.
5. Guyton & Hall, *Textbook of Medical Physiology*.

FIFTH SEMESTER B.Sc. DEGREE PROGRAMME (Theory)

ZOOLOGY OPEN COURSE- I

Code: ZO5D 03T

APPLIED ZOOLOGY

(54ours) (3 hours per week) (3 credits)

Section- A ENTOMOLOGY

1. Introduction: (1hr)

Mention Agricultural entomology, Forest entomology, Veterinary entomology Medical entomology , Forensic entomology, Industrial entomology, Nutritional entomology, Cultural entomology.

2. Agricultural Pests (7 hrs)

Definition of pest, Kinds of insect pests , Nature of damage caused and control measures of the following pests:

(a). Pests of paddy

1. *Spodoptera mauritia* (Rice swarming caterpillar)
2. *Leptocorisa acuta* (Rice bug)

(b). Pests of coconut

1. *Oryctes rhinoceros* (Rhinoceros beetle)
2. *Rhynchophorus ferrugineus* (Red palm weevil)

(c). Pests of stored products

1. *Sitophilus oryzae* (Rice weevil)
2. *Callasobruchus chinensis* (Pulse beetle)

3. Productive Insects (8 hrs)

(a). Apiculture

1. Brief description of common species of *Apis*
2. Honey bee products : bee wax and its uses, chemical composition of honey and uses

(b). Sericulture

1. Brief description of *Bombyx mori* (Mulberry silk moth), *Antheraea paphia* (tassar silkworm)
2. Sericulture and extraction of silk

3. Types of silk: Tasar, Muga and Eri Silk

(c). Lac culture

1. Brief account on lac insect (*Laccifer lacca*)

2. Uses of lac.

4. Beneficial insects (1 hr)

Role of parasites, predators, scavengers, weed killers, pollinators.

5. Insect Pest Management (5 hrs)

1. Cultural control

2. Mechanical control

3. Biological control

4. Chemical control

5. Integrated pest management (IPM)

Section- B. AQUACULTURE (6hrs)

1. Introduction, Aquaculture and scope in Kerala and India

2. Brief account on Pisciculture, Prawn culture, Mussel culture and Pearl Culture (with examples).

Section- C POULTRY SCIENCE (6hrs)

1. Introduction, Importance of egg production, Nutritive value of eggs.

2. Breeds of fowl:

a) Exotic breeds: Rhode Island Red, Plymouth Rock, New Hampshire.

b) Indigenous breeds: Chittagong, Gangus

3. Poultry breeding: Economic tracts - relation with breeding, meat produ

Section -D ANIMAL HUSBANDRY (8 hrs)

1. Introduction, Live stock husbandry - origin, domestication of cattle.

2. Breeds of cattle

3. Artificial insemination

4. Storage of semen

5. Embryo transfer technology
6. Common diseases :(a) Anthrax (b) Foot and mouth diseases (c) Rinderpest

Section -E DAIRY SCIENCE

(4hrs)

1. Importance of dairy farming
2. Common dairy Processes: a) Pasteurization b) Freezing c) Soft curd milk d) Skimmed milk e) Toned milk f) Nutritional value of milk
14. Dairy products: cream, butter, cheese, ice cream, AG mark

Section -F PARASITOLOGY

(8hrs)

1. Introduction
2. Human Parasites:
Mention the habits, habitat, life cycle, mode of infection, control measures of the following parasites: *Entamoeba histolytica*, *Plasmodium vivax*, *Taenia solium*, *Ascaris lumbricoides*, *Wuchereria bancrofti*, *Enterobius vermicularis*.
3. Insect Vectors of human diseases :
Anopheles, *Culex*, *Aedes*, *Xenopsylla*, *Cimex*, *Pediculus*, *Phthirus* (Mention habits, structure, disease caused and control).

References

- Nayar, M.R.G.K. *A Monograph on Crop pests of Kerala and their control*. 1989 , Published KAU, Vellanikkara.
- Sobti *Medical Zoology* Shoban Lal & Co.
- Boraiah, G., *Lecturers on Sericulture* 2e. 1994, SBS Pub. Bangalore.
- Cherian & Ramachandran *Bee keeping in South Indian* Govt. Press, Madras.
- Dileep de Sarkar: *The Silkworm Biology* Genetics and breeding.
- FAO. manual of silkworm rearing. a manual of mulberry cultivation. A manual of silk feeling.
- Gupta, K.C. *Romance of Scientific Bee keeping* - Khadi Pratisthan. Calicut.
- Mahadevappa, D. *et al.* *Mulberry Silk reeling Technology*.

- Mishra, R.C. Perspectives in Indian. Apiculture 2002. Agro Bios. Phillips, E.F., *Bee Keeping* 2003. Agro Bios.
- Sarda Singh: *Bee Keeping in India*, ICAR.
- Sreerama Reddy G. *Silkworm Breeding*
- Sulochana Chetty & Ganga: Sericulture.
- Tamaki. Y.: Sericology: Central Silk Board, 95-B, Marine Drive, Bombay-2.
- Ullal, S.R. & Narasimhanna. M.N.: *HB of Practical Sericulture*, Central Silk Board, Bombay.
- Alikunhi, K.M. : *Fish Culture in India*
- Cutting, C.L. *Fish Processing and preservation*. 2002, Agro.
- Day, F.: *The Fishes of India*. Vols. 1 & 11, 1971. Today and Tomorrow Book Agency Jhingan. V.C.: *Fish and Fisheries of India*. Hindustan Pub. Corpn.
- Kurian, C.V. & Sebastian. C.V.: *Prawn and Prawn Fisheries of India* Hindustan Pub. Corporation of India.
- Pillai, T.P.: *Aquaculture Principles and Practices of Fishing*, New Books.
- Rajendra Kumar Nath, R.: *Freshwater Aquaculture*, Scientific Pubs., Jodhpur.
- Samuel, C.T.: *Marine Fisheries in India*, Cochin University.
- Shammi, O. *Applied Fisheries*, 2002, Agro Bios.
- Sinu, V.R.P. & Ramachandran, V. *Reshwater Fish Culture*. ICAR.
- Srivastava, C.B.L. Fishery Science and Indian Fisheries, 2e. 2002, Kitab Mahal. Allahabad Winton. A. L.: *Fish and Fish Products*, 2000. Agro.
- Banerjee, G.C.: *ATB of Animal Husbandry*. 8e. 1998. Oxford & IBH.
- Banerjee, G.C.: *Poultry*, Oxford & IBH.
- Campbell, J.R. & Lasley, J.R.: *The Science of Animals that serve Mankind*. TMH.
- Eckles, C.R. Combs, W.B. & Macy, H.: *Milk & Milk Products*. Tata MGH.
- ICARD: *Handbook of Animal Husbandry*, 1990/97, ICAR, Pusa, N.d.
- Jull, M.A.: *Poultry Husbandry*, 3e, TMH.
- Lasley, J.F.: *Genetics of Livestock Improvement*. 1987, Prentice Hall Eaglewood.
- Linter & Sunk: *Poultry Science*, Lippincot & Co. N.Y.
- Sastry, N.S.R. Thomas, C.K. & Singh R.A.: *Poultry Production*.
- Sastry, N.S.R. *Farm Animal Management & Poultry Prodcution*.
- Sastry N.S.R.: *Farm Animal Management & Poultry Production*. Vikas.
- Singh H & Mossa: *Livestock & Poultry Production*, PHI.
- Thomas, C.K. & Sastry, N.S.R.: *Dairy Bovine Production*, 1991, Kalyani.

SYLLABUS
ELECTIVE COURSES

ZO6B 23(E) 01,02&03

SIXTH SEMESTER B.Sc. DEGREE PROGRAMME-(Theory)

ZOOLOGY ELECTIVE COURSE- III

Code: ZO6B23(E) 01

HUMAN GENETICS

(54 hours) (3 hours per week) (3 Credits)

- 1. Introduction: Scope and Significance (1 hr)**
- 2. Identification of human chromosomes (6 hrs)**
 - (a) History and nomenclature of human chromosomes – various conferences and their contributions: Denver, Chicago, Paris, Stockholm, Conferences.
 - (b) Characteristics of human chromosomes by non-banding techniques: A to G groups, various banding techniques, G-banding, Q-banding, R-banding, C-banding, Y-banding and NOR, FISH.
 - (c) Designating structural chromosomal abnormalities by different mechanisms – Use of sister chromatids.
- 3. Human Pedigrees (8 hrs)**
 - (a) Pedigree construction, data collection, analysis and pedigree charts of autosomal dominant, autosomal recessive, X-linked dominant and recessive genes.
 - (b) Autosomal dominant inheritance
Familial hyper cholesterolemia, metabolic and genetic control of cholesterol, myotonic dystrophy, dimples, free and attached ear lobes, interlocking of fingers.
 - (c) Autosomal recessive inheritance, cystic fibrosis, CF gene and protein, detention of CF homozygotes and carrier hereditary microphaly.
 - (f) X-linked recessive inheritance:
Duchene's muscular dystrophy, identification of the DMD gene, carriers and hemizygotes, multiple sclerosis.
 - (g) Other methods of inheritance

X-linked dominant inheritance – hypophosphatemia, Y-linked genes – brief mitochondrial genes.

(h) Multifactorial inheritance

Congenital heart diseases, Alzheimer's disease, Schizophrenia, intelligence, stature, blood pressure, refractive index of the dermatoglyphic ridge count.

4. Reproduction and Development (4 hrs)

(a) Prenatal development: genes and hormones.

(b) Errors in sexual development: Defects of androgen target cells – deficiency of 5 alpha reductase, congenital adrenal hyperplasia, and sex reversal.

(c) Genetics of embryonic development

Maternal effect genes, consanguinous marriage and effects of inbreeding isolates, segmentation and pattern formation genes, adhesion of molecules and genes: programmed cell death (apoptosis) and suicide genes.

(d) Genetic imprinting (brief account) imprinting and human disorders.

5. Twins in the study of Genetics, biology of twinning – analysis of twin's data. (1 hr)

6. Behavioural traits:

(a) Genetic component to human behaviour intelligence – IQ and its heritability.

(b) Personality.

(c) Alcoholism

(d) Mental disorders (2hrs)

7. Chromosomal abnormalities:

Ring chromosome, premature chromosome, fragile X-chromosome, Unexpected variation in gene structure and function, myotonic muscular dystrophy, Huntington disease, abortion, still birth, neonatal death: chromosomal aberration in mental retardation. (5 hrs)

8. Pharmacogenetics & Eco genetics with examples (2 hrs)

9. Evolutonary genetics: Human genetic diversity, average mutation rate in human genes, human races, human variability, messages from mitochondrial DNA. **(3 hrs)**

10. DNA in Laboratory

The polymerase chain reaction, cloning human DNA in other species, DNA sequencing, Road maps of the human genome, Human genome project (details). **(6 hrs)**

11. Gene therapy

History, types of gene therapy, germ line zygote, somatic cell gene therapy, genetic diseases that are treatable, future of gene therapy, screening, early detection of genetic disorders, screening for heterozygotes, various problems and issues associated with gene therapy and ethical aspects. **(6 hrs)**

12. Genetic counselling:

Procedures and ethical concern, history of counselling, methods of genetic counselling, marriage counselling, directive and non directive reason for seeking counselling, psychodynamics of genetic counselling. **(5 hrs)**

13. Genetic services:

Pre-natal diagnosis, amniocentesis, chorionic villi sampling, foetoscopy, ultrasound sonography, succal test, prenatal sexing, legislation test tube babies, karyotyping, use of computers, ethics in medical genetics. **(5 hrs)**

Topics for Seminars / Assignment / Discussion

- (a) Human genome project: Pros and cons in new era.
- (b) Role of genetics in modern reproductive techniques.

Books for Reference

Principles of Human Genetics: Curtstein Euresia Publishing House.

Human Genetics: Gangane S.D., Bichurlev, New Delhi.

Genetics in Medicine: Thomson & Thomson, W.B. Saunders.

Human Genetics: Mc: Kursick, V.A.

Basic Human Genetics: Elaine Johansen Mange & Arthur P. Mange, Rastogi Publications, Shivaji Road, Meerut.

John Ringo; Fundamentals of Genetics- Cambridge University press

ELECTIVE COURSE PRACTICALS III*D

Code No.ZO6B 24(P)

Human Genetics

1. Problems on (a) autosomal dominant and recessive (b) polygenic traits (skin colour), (c) Sex linkage (X-linked genes and Y-linked genes).
2. Study of identical and fraternal twins.
3. Dermatoglyphics: Identification of arch, loop and whorl patterns; total ridge count in male and female; Trindii – importance of atd angle, simian line.
4. Ischiara chart – to detect colour blindness (red-green).
5. Seminars on genetics in cardiology, oncology and genetic counselling, prenatal sexing, amniocentesis, importance of genetic screening.
6. Examination of Barr bodies.
7. Pedigree studies and identification of the nature of inheritance from pedigree charts (any one trait).
8. Identification of human karyotypes (Down's, Turner's, Klinefelter's) from idiogram.

SIXTH SEMESTER B.Sc. DEGREE PROGRAMME (Theory)

ZOOLOGY ELECTIVE COURSE- III*D

Code: ZO6B23(E)02

AQUACULTURE, ANIMAL HUSBANDRY & POULTRY SCIENCE

(54 hours) (2 hours per week) (3 credits)

A. AQUACULTURE

1. Introduction, its scope in India and Kerala, Export potential, Different types of cultures. **(2 hrs)**
2. Mariculture **(3 hrs)**
 - (a) Prawn culture: Important culture varieties, Pokkali culture, breeding spawning, control breeding, induced maturation, eye stalk ablation, culture methods, freezing, curing and canning.
 - (b) Mussel culture: *Perna indica*, *Perna viridis*, Seed collection, artificial seed production, induced spawning, rearing, raft culture, harvesting.
3. Pisci culture
 - (a) Egg collection, induced spawning, construction, preparation and maintenance of ponds, manuring, feeding and harvesting, cryo preservation of fish germplasm, semen bank and preservation media. **(4 hrs)**
 - (b) Biology and culture of Indian major carps – *Catla catla*, *Labeo rohita*, *Cirrhina mrigala*. **(2 hrs)**
 - (c) Biology and culture of Exotic carps. Eg: *Hypophthal michthys molitris* – (Silver carp). **(1 hr)**
 - (d) Inland fishes and Fisheries – eg: *Channa*, *Clarius* - Rivers, Paddy fields, Utilisation of sewage in fish culture.
 - (e) Genral account and fishery aspect of sardine, shark, tuna. **(3 hrs)**
 - (f) Ornamental fisheries – common aquarium fishes, aquarium management and identification of sex. eg: *Carassius auratus* (Gold fish), *Peterophyllum* sps., *Astronotus ocellatus* (Guppy) – *Lebister reticulatus*. **(2 hrs)**

4. Plankton and Fishery production – Zoo and Phytoplankton – Vertical migration – Plankton and Productivity. **(2 hrs)**
5. Fishing Gears: Gill net / drift gill net, purse-seines, harpoon, Chinese dipnets, echo sounders, sonar, remote sensing. **(3 hrs)**
6. Fish Spoilage and Preservation – Biochemical changes, spoilage, use of ice, freezing, canning, dehydration, salting, smoking.
7. Fish utilisation **(4 hrs)**
 Nutritive value, bye products, liver oil, body oil, fish meal, fish flour, Isin glass, glue, skin, fin soup, lime, chitin, chitosan.
8. Diseases and parasites of Fish – Fungal infection – by – Saproleginia – Bacterial – Fin & tail rot disease, Dropsy. **(2 hrs)**
9. Mud banks of Kerala coast **(1 hr)**

B. POULTRY SCIENCE : Introduction and Scope

- (a) Egg production, cable bird production, nutritive value, bye products. **(6 hrs)**
- (b) Different breeds – Exotic – 3 examples.
 Indigenous – 2 examples.
- (c) Poultry rearing : Selection of eggs, hatching, incubation, brooding, sexing, vaccination.

Poultry housing: Free range system, Semi-intensive system (deep litter system and individual cage system).

Equipments for feeding: Nutrients for starting, growing, laying hen.

Common poultry feeds, food rations, and feed formulation.

Common diseases of poultry (Ranikket, Pullorum, Fowl pox).

C. ANIMAL HUSBANDARY **(6 hrs)**

Introductin: history, origin, domestication.

Breeds of cattle:

Milk type : Sindhi, Gir

Draft breed: Nagori & Kangayam

Dual purpose: Ongole, Hariana

Exotic breed : Jersey, Holstein – Friesian

Native breeds: Conservation programmes, Vechur cow.

Feeding: Common cattle feeds, fodder

Common diseases : Anthrax, Foot & Mouth disease. Parasites.

Meat hygiene: Slaughter and clean meat production – Zoonotic diseases.

D. DAIRY SCIENCE (4 hrs)

Role of dairy development in rural economy employment opportunities, white revolution.

Dairy processes: Staining, Filtration, Cooling, Chilling, Clarification, Pasteurisation, Freezing, Recombined milk, Soft curd milk, Skimmed and toned milk.

Artificial milk, Milk – adulteration.

Topics for Seminar / Assignment / Discussion

1. Role of physical and chemical factors in aquaculture.
2. Fish weed organism: Sea weed culture. eg: Grassilaria, Sargassum.
3. Dairy products, manufacture and nutritive value.

References:

1. Banerji, G.C. : A text book of Animal husbandry, 1998. Oxford & IBH.
2. Banerji, G.C. Poultry, Oxford & IBH.
3. P.R. Venkitaraman: Economic Zoology.
4. V. Sudheeran: Economic Zoology.
5. Kurian C.V., Sebastian C.V. : Prawn and Prawn fisheries in India, Hindustan Publication Corporation of India.
6. Alikunhi, K.R. : Fish culture in India, KAV, ICAR.

ELECTIVE COURSE PRACTICALS
ELECTIVE COURSE PRACTICAL- III*D

Code No:ZO6B24(P)

36 Hours 2 Hours per week/2 Credits

Aquaculture, Animal husbandary and Poultry Science

1. Culture of fish food organisms: protozoans, rotifers and crustaceans.
2. Maintenance of spawn and its transportation to hatching or rearing tanks.
3. Identification of major food fishes (fresh water, estuarine and marine).
4. Study of different crafts and gears.
5. Study of aquarium and aquarium fishes / ornamental fishes.
6. Breeding techniques: preparation of hormone extracts and injection of hormones to fishes; eyestalk ablation in prawns.
7. Study of fish products and byproducts.
8. Identification of larval forms of prawn, pearl oyster, mussel, lobster and crab.
9. Identification of major edible crustaceans and mollusks.
10. Identification of edible sea weeds.

SIXTH SEMESTER B.Sc. DEGREE PROGRAMME(Theory)

ZOOLOGY ELECTIVE COURSE- I

Code: ZO6B 23 (E) 03T

APPLIED ENTOMOLOGY

(54 hours) (3 hours per week) (3 credits)

A. Agricultural Entomology

1. Introduction to Entomology (5 Hrs)

Mention Agricultural entomology, Forest entomology, Veterinary entomology, Medical entomology, Forensic entomology, Industrial entomology, Nutritional entomology, Cultural entomology.

Classification of Class Insecta down to orders, General organization of an insect.

2. Insects in Service of Man (2 hrs)

Useful products, Useful body, Galls, Pollinators, Destroyers of insect pests, Serve as food for animals and even man, Destroyers of weeds, Improve soil fertility, Act as scavengers, Aid in scientific research, Aesthetic and entertainment value, Use in medicine, Pollution indicators, Arrow poisons, Cold light, Insects in forensic science, Utility of insect pheromones and hormones (very brief account).

3. Insects as enemies of Man: (23 hrs)

Definition of pests, kinds of insect pests, causes of pest outbreak, pests injurious to plants and animals, pests as vectors of diseases,

(a) Pests of Paddy: (Life history, damage and control measures)

1. *Spodoptera mauritia* (Rice swarming caterpillar)

2. *Leptocorisa acuta* (Rice bug)

3. *Diuraphis armigera* (Rice hispa)

(b) Pests of coconut: (Life history, damage and control measures)

1. *Oryctes rhinoceros* (Rhinoceros beetle)

2. *Opisina arenosella* (Black headed caterpillar)

3. *Aceria guerreronis* (Coconut mite)

(c) Pests of sugar cane (damage and control measures)

1. *Chilo infuscatellus* (Sugarcane shoot borer)
2. *Scirpophaga nivella* (Sugarcane top shoot borer)
3. *Sacchariococcus sacchari* (Cane mealy bug)

(d) Pests of plantation crops: Coffee, rubber, tea, pepper and cardamom.
(Two

examples for each , Damage, control measures)

- Coffee: 1. *Xylotrechus quadripes* (Coffee white stem borer)
 2. *Coccus viridis* (Coffee green bug)

- Tea : 1. *Helopeltis antonii* (Tea mosquito bug)
 2. *Toxoptera aurantii* (Tea aphid)

- Rubber: 1. *Aspidiotus destructor* (Scale insect)
 2. *Comocrits pieria* (Bark caterpillar)

- Pepper: 1. *Longitarsus nigripennis* (Pollu beetle)
 2. *Laspeyresia hemidoxa* (Shoot borer)

- Cardamom: 1. *Sciothrips cardamomi* (Cardamom thrips)
 2. *Eupterote canarica*(Cardamom hairy caterpillar)

(c) Pests of fruits and vegetables (Banana, mango, cashew, lady's finger, chilly, pulses, etc.) Two examples for each, Damage and control measures.

Pests of fruit plants:

- Banana : 1. *Cosmopolites sordidus* (Banana weevil)
 2. *Pentalonia nigronervosa* (Banana aphid)

- Mango : 1. *Batocera rufomaculata* (Mango stem borer)

2. *Dacus dorsalis* (Fruit fly)

Cashew : 1. *Plocoederus ferrugineus* (Cashew stem borer).

2. *Helopeltis antonii* (Cashew mirid).

Pests of vegetables:

Lady's finger: 1. *Platyedra gossypiella* (Pink ball worm)

2. *Earias vitella* (Spotted ball worm)

Brinjal : 1. *Leucinodes orbonalis* (Shoot and fruit borer)

2. *Epilachna vigintioctopunctata* (Epilachna beetle)

Cucurbits : 1. *Dacus cucurbitae* (Melon fly)

2 *Raphidopalpa foveicollis* (Pumpkin beetle)

(d) Pests of stored products. (damage and control measures).

1. *Tribolium castaneum* (Rust red flour beetle)

2. *Callasobruchus chinensis* (Pulse beetle)

(e) Pests of domestic animals: 3 examples.

1. Domestic fowl: *Menopon gallinae* (Shaft louse)

2. Goat : *Oestrus ovis*

3. Cattle : *Tabanus striatus* (Horse fly)

4. Insect Pest Control:

(12 hrs)

(a) Natural control (b) Applied control or Artificial control:

Prophylactic and Curative methods [cultural, mechanical, legal methods (brief account), biological and chemical methods].

Biological control : History; Ecological, biological and economic dimensions of

biological pest control methods , Mention any 3 important biological control project undertaken in India. Merits and demerits.

Chemical control: Classification, Insecticides of plant origin; Insecticides, Mention insecticide residue, resistance and resurgence of insect pests; Pesticide appliances (Hand compression sprayer, Knapsack sprayer and Rocker sprayer); Precautions in handling insecticides (brief account).

Modern methods of Pest control: Autocidal and Pheromonal control (brief account)

Integrated Pest Management (IPM): Features, advantages (brief account).

B. Industrial Entomology

(12 hrs)

Productive Insects

- (a) **Honey bee:** Apiculture and its scope; Different species, Social organization, structure of worker bee, life history (brief account) and communication; Bee products: Honey and Bee wax, Composition and Uses, Bee diseases.
- (b) **Silk moth:** Different types of silkworms, life cycle (brief account); Sericulture (brief account), moriculture, Processing and extraction of silk (brief account), Diseases of silk worms, composition and uses of silk.
- (c) **Lac insect:** Different strains of Lac insects; cultivation, inoculation and harvesting, propagation of lac ; composition and uses of lac, enemies of lac insects.

Seminars / Assignment / Discussion

1. Biology of major insect vectors of human diseases, *Anopheles*, *Culex*, *Aedes*, *Xenopsylla*, *Pediculus*, *Cimex*, *Phthirus*.
2. Diseases and its control measures of Filariasis, Yellow fever, Dengue, Typhus fever, Plague and Kala-azar.
3. Collection and Preservation of Insects.
4. Insects as human food for the future.
5. Causes of success of insects.

References

1. Atwal, A.S and Dhaliwa, G.S.(2008) *Agricultural Pests of south Asia and their Management*, 6 e, Kalyani Publishers

2. Bhaskaran, K.K and Francy, C. F (2010) *Elements of Applied Entomology*, Manjusha Publications.
3. Dhaliwal, G.S. *et al* (2008) *Essentials of Agricultural Entomology*, Kalyani Publishers
4. Hill D.S. *Agricultural Entomology*
5. Metcalf, C.L. & Flint, W.P. (1973) *Destructive and Useful Insects*, USTMH,
- 6 Nalina Sundari, M.S and Santhi,R. *Entomology*, MJP Publishers
7. Nayar, K.K. *et al*. *General and Applied Entomology*, TMH
8. Nair, M.R.G.K. *A Monograph on Crop pests of Kerala and their control*. 3e. 1989 KAU Publ., Vellanikkara.
9. Nair. M.R.G.K. *Insect & Mite Crops in India*
10. Pedigo *.Entomology & Pest Management*
11. Ramakrishna Ayyar, T.V. Maras, 1963.*Handbook of Economic Entomology for South India*,
- 12 Srivastava,K. P. *A Text book of Applied Entomology* , Vol. I & Vol. II, Kalyani Publishers, Ludhiana, New Delhi, Noida (U.P.).

ZOOLOGY ELECTIVE COURSE:II (PRACTICAL III* – D)

APPLIED ENTOMOLOGY

Code: ZO6B 24(P) Elective

(36 hours) (2hours per week) (2 credits)

1. Identification and brief notes on the following pests:
Any 2 pests each of paddy, coconut, banana, mango, cashew, coffee, tea, rubber, pepper, cardamom, and pests of vegetables.
Pests of stored products (any 3)
2. Study of damage caused by pests: (damaged parts of plants, fruits and seeds, wood, pepper, etc. may be used).
3. Identification and study of insect pests / ectoparasites of man, domestic animals and wild animals: mosquitoes [different stages of life history], head louse, pubic louse, bird louse, rat flea, *Tabanus*, *Hippobosca*, a tick and a mite on dog / cat.
4. Identification and economic importance of the following:
 - (a) Honey bees and bee products
 - (b) Silkworm moth: life cycle stages, silk fibre
 - (c) Lac insect and stick lac or shellac.
5. Preparation of: a) tobacco decoction, b) kerosene soap emulsion, c) neem kernel suspension.
6. Pesticide appliances: Dusters or sprayers a) Hand compression sprayer, b) Rocker sprayer, c) Knapsack sprayer / duster (d) Hand automizer (any 3).

MODEL QUESTION PAPERS
CORE COURSES

MODEL QUESTION PAPER

FIFTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – **Zoology**

Core Course VIII – GENERAL METHODOLOGY IN SCIENCE,
BIostatistics and INFORMATICS

Code: ZO5B14

[from 2013 Admission]

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice Questions

1. Which of the following is a secondary data?
a) Direct personal investigation b) local correspondence
c) Questionnaire d) published data
2. The data grouped in a category is called _____.
a) Class interval b) frequency c) class d) sample
3. The first scientific journal is _____.
a) Nature b) Philosophical Transactions
c) Acta Zoologica d) Journal des Scayans
4. Which of the following is regarded as a Formal Science?
a) Physics b) Chemistry c) Mathematics d) Biology

B. Match the Following

5. Patent Observing and measuring the subject of inquiry
6. Sampling Act of taking ideas or writings of others as one's own

- | | | |
|----|------------|---|
| 7. | Plagiarism | Grant of exclusive right to make, use or sell invention |
| 8. | Simulation | Selecting a part of the whole population under study
Reproducing an experiment/ structure/ process |

C. Fill in the blanks

9. A set of values recorded for an event is called _____.
10. _____ is an assumption or question based on the observation and measurements of the subject of scientific investigation.
11. The square of standard deviation is known as _____.
12. The store of scientific information is called _____.

D. True or False

13. 't' test is a method to find out the role of a factor in a scientific study.
14. A controlled experiment is one in which all parameters, except the one under study, remain constant.
15. A theory is a hypothesis supported by extensive experimentation.
16. Census is not regarded as a valid method of investigation of a population.

E. Name the following

17. Mention the oldest National Academy of Science.
18. What is meant by scientific data archiving?
19. Define the term 'Techknowledgey'.
20. Enumerate four advantages of sampling. (20 x 0.25 = 5)

II. Short Answer:

21. Define the term mode.
22. Highlight the role of observations in the decision-making of a scientist.
23. Write a brief note on explorative experiment.
24. What is the significance of repeatability of scientific investigation?
25. What is meant by standard error?
26. What is meant by critical region in statistical analysis? (6 x 1 = 6)

III. Short Essay:

27. Explain the procedure of peer reviewing of a scientific paper.

28. State the conditions that lead to the transformation of a hypothesis into a theory. Can every experiment lead to a theory? Substantiate.
29. Construct a Pie-diagram to represent the following data on degree results of an Indian University in March, 2008.

<u>Item</u>	<u>Frequency</u>	
First class	6452	
Second class	2237	
Third class	1782	
Failed	629	(3 x 2 = 6)

IV. Long Essay

30. a) Give an account of the Revolutions in Science.

OR

b) Explain the major parameters and steps to be considered in planning a scientific experiment.

31. a) With the help of a suitable example explain the format of a scientific data table. What are the advantages and disadvantages of tabulation of data?

OR

b) Calculate the mean and standard deviation of the following data obtained from a town in Tamil Nadu.

No. of members in the family	1	2	3	4	5	6	7	8	9
No. of families in the census	77	215	816	9273	15818	7114	648	140	39

(2 x 4 = 8)

MODEL QUESTION PAPER

FIFTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – **Zoology**

Core Course VIII – GENERAL METHODOLOGY IN SCIENCE,
BIostatistics and INFORMATICS

Code: ZO5B14

[From 2013 Admission]

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice Questions

1. Which of the following is a primary data?
 - a) Government publications
 - b) Personal interview s
 - c) Private publications
 - d) Journals and Newspapers
2. Histogram is a _____.
 - a) Diagrammatic presentation of data
 - b) Graphical presentation of data
 - c) Semi-tabular presentation of data
 - d) cartogram
3. While attempting to cross a stream, which one of the following information regarding the depth of the river is important?
 - a) Mean depth
 - b) range of depth
 - c) Median depth
 - d) standard deviation
4. Which of the following is regarded as a Natural Science?
 - a) Statistics
 - b) Logic
 - c) Mathematics
 - d) Physics

B. Match the Following

5. Classical method of Scientific inquiry Charles S. Pierce
6. Pragmatic method of Scientific inquiry Karl Pearson

7. Chi-square test was first proposed by Ronald Fisher
8. Standard deviation was first suggested by Aristotle
Charles Babbage

C. Fill in the blanks

9. A Government grant of the exclusive right to make, use or sell an invention, usually for a limited time is called _____.
10. _____ is an assumption or question based on the observation that may provide valid explanation of the observation.
11. The act of taking ideas or writings of another person and passing them off as one's own is known as _____.
12. Scientific papers are customarily published in journals after _____.

D. True or False

13. Experimental design deals with the design and analysis of experiments.
14. F test is used in statistics to find out the degrees of freedom.
15. Data collection is a part of experimentation in Science.
16. Sampling is a statistical method of investigation of populations.

E. Name the following

17. Mention a scientific publication of CSIR.
18. What is a controlled experiment in Science?
19. What is meant by virtual testing?
20. What is a continuous series? (20 x 0.25 = 5)

II. Short Answer:

21. Mention four methods used for Statistical analysis.
22. Enumerate four advantages of sampling.
23. Distinguish between inductive and deductive methods.
24. Why scientific experiments need to be replicated for a few times?
25. Funding and publication of the results are the major hurdles in Research Programmes. Do you agree with this statement? Give reasons in favour of your opinion.
26. With the help of a format, describe the major functional parts of a statistical table.

III. Short Essay: (6 x 1 = 6)

27. Briefly explain the role of science in dispelling myths, misconception and disbeliefs associated with biogenesis.
28. Compare and contrast mathematical methods and scientific methods.
29. Find out the mean of the following distribution following the direct method.

<u>Marks</u>	<u>No. of students</u>
0 -10	5
11 -20	13
21 -30	16
31 -40	15
41 -50	7

(3 x 2 = 6)

IV. Long Essay

30. a) Give an account of the Repositories of Scientific information.
OR
b) Explain the major parameters and steps to be considered in planning a scientific experiment.
31. a) Give an outline classification of the methods of presentation of data. With the help of a suitable example explain any one method.
OR
b) Calculate the mean and standard deviation of the following data obtained from a factory in Karnataka.

Age group	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
No. of employees	25	45	154	273	381	174	108	43

(2 x 4 = 8)

MODEL QUESTION PAPER

SIXTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Core Course X – MOLECULAR BIOLOGY AND BIOINFORMATICS

Code: ZO6B 18T

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice Questions

1. GSM and CDMA are associated with
(a) Mobile phones (b) Computers (c) Internet (d) Laptop
2. A data base of ungapped multiple alignments for protein/peptide families in PROSITE
(a) BLOCKS (b) PRINTS (c) BLAST (d) CORBA
3. The process of applying different style, size, color to the text is called
(a) Formatting (b) Processing (c) Computing (d) Organizing
4. A list of options or items displayed on the program windows is the
(a) Menu (b) Icon (c) Windows (d) Toolbar

B. Match the Following

- | | |
|-----------------|-----------------|
| 5. CPU | Monitor |
| 6. Inkject | Mouse |
| 7. Input device | Printer |
| 8. Page | ALU |
| | Electrophoresis |

C. Fill in the blanks

9. The full form of LAN is _____

10. An alignment program for protein sequences created by Pearson and Lipman in 1988 is _____
11. The term _____ indicates proteins expressed by a genome and is the systematic analysis of protein profiles of tissues.
12. _____ is the study of all the genes of an organism including their sequences, structure regulation, interaction and products

D. True or False

13. Introns are non coding sequences
14. Ribozyme is an RNA sequence
15. EMBL is an example of primary data base
16. DDBJ-is the DNA data bank of USA

E. Name the following

17. The complete set of mRNAs transcribed in a cell is called
18. Name the nucleic acid data base maintained by NCBI ,USA
19. Name the first calculating device invented in Egypt
20. Name the operating system developed by Microsoft corporation

(20 x 0.25 = 5)

II. Short Answer:

21. What is blue tooth technology?
22. Explain the typical application of RFID.
23. What are the hazards of e. waste?
24. Differentiate between data ,information and knowledge with a suitable example
25. What is bioinformatics, mention important areas in bioinformatics
26. Distinguish between structural and functional genomics (6 x 1 = 6)

III. Short Essay:

27. Describe different kinds of genomic data bases.
28. Describe in short general features of PROSITE.
29. Explain multiple sequence alignment.

(3 x 2 = 6)

IV. Long Essay

30. Describe the main features of BLAST and FASTA format
OR

Discuss any one national e-governance initiative

31. Explain the concept of tele medicine. Comment on its appropriateness in the third world

OR

What do you understand by sequence alignment? Explain different types of alignments used in sequence analysis. (2 x 4 = 8)

MODEL QUESTION PAPER

FOURTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Core Course IV - ENVIRONMENTAL BIOLOGY, WILDLIFE
CONSERVATION, TOXICOLOGY

Code: ZO5B09T

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A) Multiple choice:

1. Germplasm theory was proposed by:
(a) Charles Darwin (b) August Weisman
(c) Ernest Heckel (d) J.B. Lamark.
2. Which among the following is a vestigial organ?
(a) Forelimb (b) Mitral Valve
(c) Pineal body (d) Vermiform appendix
3. Tiger preying on deer is an example of:
(a) Mutualism (b) Commensalism
(c) Predation (d) Parasitism
4. Which animal among the following enjoys discontinuous distribution?
(a) Human beings (b) Crocodile
(c) Lung fish (d) Crow

B) Match the following

5. Edge effect a) Cromagnon
6. Habituation b) *Macaca silensis*
7. Human fossil c) Sparrow
8. Silent Valley d) Ecotone
e) Archeopteryx

C) Fill in the blanks

9. The term 'Ecology' was coined by _____.
10. Peripatus enjoys _____ distribution.
11. Suckling in babies is an example of _____ learning.
12. Genetic drift is otherwise known as _____.

D) State whether the statement is True or False:

13. Theory of use and disuse was proposed by Charls Darwin.
14. Richest and most threatened reservoir of plant and animals is hotspot.
15. The Red Data Book is a guide for formulation, preservation and management of species.
16. Sea is not a barrier for amphibians.

E) Answer the following in one word or one sentence.

17. Define habitat.
18. Eg. of endangered species.
19. Define natality.
20. What is latent learning? (20 x 0.25 = 5)

II. Short Answer

21. Explain inheritance of acquired characters.
22. Explain Leibig's law of minimum.
23. Distinguish between parasitism and predation.
24. Brief four geographical realms of the world.
25. Explain in situ conservation with examples.
26. Write importance of wild life management and conservation.

(6 x 1 = 6)

III. Short Essay

27. Write Faunal characteristics of Ethiopian region.
28. Describe the main attributes of a population.
29. Comment on toxicants and health hazards. (3 x 2 = 6)

IV. Long Essay

30. What are biogeochemical cycles?
 - (a) Explain Nitrogen cycle.
- OR
- (b) Explain Darwinian concept of organic evolution.

31.a) Mention the geographical boundaries of Oriental region. Comment on fauna of the region.

OR

(b) Explain different types of population interactions. (2 x 4 = 8)

MODEL QUESTION PAPER 2

FOURTH SEMESTER B. Sc. DEGREE EXAMINATION,

Part III – Zoology

Core Course VI - ETHOLOGY, EVOLUTION & ZOOGEOGRAPHY

Code: ZO5B10T

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A) Multiple choice:

1. Who proposed the theory of Natural Selection?
(a) Hugo De Vries (b) Charles Darwin
(c) August Weismaan (d) J.B. Lamarck.
2. Which of the following is a vestigial organ?
(a) Tricuspid valve (b) Wisdom teeth
(c) Third limb (d) Cochlea
3. Rio Earth Summit was held in the year:
(a) 1994 (b) 1993
(c) 1980 (d) 1992
4. Protopterus is an example for:
(a) Universal Distribution (b) Polar distribution
(c) Discontinuous distribution (d) Bipolar distribution

B. Match the following:

- | | |
|-----------------------|------------------|
| 5. Living fossil | a. Sea anemone |
| 6. Conditioned reflex | b. Peripalpus |
| 7. Hermit Crab | c. Ernst Haeckel |
| 8. Connecting link | d. Tiger |
| | e. Lung fish |
| | f. Pavlov |

C. Fill in the blanks

9. _____ is an example of Continental Island.
10. The golden age of reptiles is called _____.
11. Collection of genes in a population is called _____.
12. _____ is the first National Park in India.

D. State whether the statement is True / False.

13. Wild life reservoir is an example of ex situ conservation.
14. The Red Data Book was issued by IUCN in 1966.
15. Evolution of limb is an example of Analogous organ.
16. Marsupials occur in N. America.

E. Answer the following in one word / sentence.

17. Define stimulus.
18. What is endangered species.
19. What is edge effect?
20. Define Mortality. (20 x 0.25 = 5)

II. Short Answer

21. Distinguish between Parasitism and Predation.
22. Name the four zoogeographical realms of the world.
23. Explain briefly limiting factors.
24. Write any four faunal characteristics of Australian region.
25. Briefly explain causes of Biodiversity loss.
26. Explain the ecological impacts of tourism. (6 x 1 = 6)

III. Short Essay

27. Comment on the health hazards of toxicants.
28. Write a short note on Genetic drift.
29. Explain Hardy Weinberg equilibrium with an example. (3 x 2 = 6)

IV. Long Essay

- 30.(a) Define population. Describe the characteristics of population.

OR

- (b) Trace the ancestry of human beings.

- 31.(a) Write an account on global cycling of carbon and nitrogen.

OR

- (b) Explain embryological evidences of evolution. (2 x 4 = 8)

MODEL QUESTION PAPER 1

FIRST SEMESTER B. Sc. DEGREE EXAMINATION, DECEMBER

Part III – Zoology

Core Course I – ANIMAL DIVERSITY: NONCHORDATA Part I

Code: ZO1B01 T

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A) **Multiple choice:**

- The structure concerned with offense and defense in *Physalia* is
a) dactylozoid b) gastrozoid c) pneumatophore d) gonozoid
- Which of the following is an ectoparasite?
a) *Fasciola* b) *Ancylostoma* c) *Plasmodium* d) *Hirudinaria*
- Red tide phenomenon is associated with
a) *Sepia* b) *Panaeus* c) *Noctiluca* d) *Rhizostoma*
- Which of the following is not a respiratory organ?
a) trachea b) ctenidium c) gonangium d) epipodite

B. **Match the following:**

A		B
5. <i>Limulus</i>	___	Cidippid
6. <i>Neanthes</i>	___	Nauplius
7. <i>Phoronis</i>	___	Trilobite
8. <i>Panaeus</i>	___	Trochophore
	___	Actinotrocha

C. **State whether the statement is true or false:**

- Trichonympha* is an endoparasite in the gut of Termite.
- Hirudinaria* is a fresh water leech.
- Spirostreptus* belongs to class Arachnida.

12. Petasma serves as an organ for the transfer of spermatophore in *Penaeus*.

D. Answer in a word or a phrase or a sentence:

13. Mention the disease caused by hookworms.
14. Mention the phylum to which *Noctiluca* is belongs.
15. Mention an example for an orthonectid mesozoan.
16. What are choanocytes?

E. Fill in the blanks:

17. Parenchymula is a larva in the life cycle of some _____.
18. _____ is the unit of structure and function of the eyes of *Penaeus*.
19. *Pila* uses _____ for rasping the food.
20. _____ is the sexual part in the body of *Heteronereis*.

(20 x 0.25 = 5)

II. Short Answer

21. Comment on the affinities of *Peripatus*.
22. Mention the function of hepatopancreas.
23. Mention the phylum and class to which *Nautilus* is assigned.
24. Justify the inclusion of *Fasciola*, *Taenia* and *Bipalium* under the same phylum.
25. Draw a labelled diagram of the first maxilleped of *Penaeus*.
26. Trace the course of water in the respiratory system of *Pila*.

(6 x 1 = 6)

III. Short Essay

27. Give an account of *Balanoglossus*.
28. Enumerate four salient features of the phylum Chaetognatha.
29. What are trilobites? Mention their evolutionary significance.

(3 x 2 = 6)

IV. Long Essay

30. Describe the canal system in sponges.

OR

Explain the salient features of the phylum Arthropoda. Mention the major classes of arthropods.

31. Describe the digestive system of *Pila*. Add a note on the method of feeding.

OR

With the help of a diagram describe the female reproductive system of *Penaeus*.

(2 x 4 = 8)

MODEL QUESTION PAPER

FIRST SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology [Core]

Core Course I – ANIMAL DIVERSITY: NONCHORDATA- Part II

Code: ZO2B03T

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

- I. Objective type questions (each question carries a weightage of 0.25)
- A) Multiple choice:**
- The cell organelle concerned with osmoregulation in *Paramecium* is
a) food vacuole b) cisternae c) cytophyge d) contractile vacuole
 - Which of the following is a sanguivore?
a) *Arenicola* b) *Neanthes* c) *Chiton* d) *Hirudinaria*
 - Pearl is a product of commerce obtained mainly from
a) *Sepia* b) *Pinctada* c) *Pila* d) *Lamellidens*
 - Which of the following is not an excretory organ?
a) nephredium b) coxal gland c) solenocyte d) osphradium
- B) Match the following:**
- | A | | B |
|-------------------------|-----|--------------------|
| 5. <i>Pleurobrachia</i> | ___ | Polymorphic colony |
| 6. <i>Schistosoma</i> | ___ | Living fossil |
| 7. <i>Limulus</i> | ___ | Comb jelly |
| 8. <i>Halitemma</i> | ___ | Sleeping sickness |
| | ___ | Blood fluke |
- C) State whether the statement is true or false:**
- Bonellia* exhibits sexual dimorphism.
 - Tube feet are the locomotory organs of *Neanthes*.
 - Sacculina* causes parasitic castration in the host crab.

12. Tornaria is the larva of *Balanoglossus*.

D) Answer in a word or a phrase or a sentence:

13. Mention the disease caused by hookworms.

14. What are nematocysts?

15. Define binary fission.

16. Give the common name of *Physalia*.

E) Fill in the blanks:

17. Gemmule is a reproductive stage of some animals of the phylum _____.

18. Malaria is caused by the protistan parasite _____.

19. _____ is the respiratory organ of *Palamnaeus*.

20. _____ is an example for phylum Rotifera.

(20 x 0.25 = 5)

II. Short Answer

21. Enumerate any four characteristic features of the phylum Mollusca.

22. Give an account of the distribution of *Peripatus*.

23. Write a note on Trilobita.

24. Justify the inclusion of *Spirostreptus*, *Eupagurus* and *Tabanus* in the same phylum.

25. Draw a labelled diagram of the parapodium of *Neanthes*.

26. Compare the structure of polyp and medusa of *Obelia*. (6 x 1 = 6)

III. Short Essay

27. Give an account of social organization in an insect you have studied.

28. What are the diagnostic features of the phylum Cnidaria?

29. Briefly explain the affinities of *Peripatus*. (3 x 2 = 6)

IV. Long Essay

30. Describe the water vascular system of star fish.

OR

With the help of a diagram describe the nervous system of *Pila*.

31. With the help of a diagram describe the cephalic appendages of *Penaeus*.

OR

With the help of a diagram describe the digestive system of *Neanthes*.

(2 x 4 = 8)

MODEL QUESTION PAPER

FIFTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Core Course VI – CELL BIOLOGY & GENETICS

Code: ZO5B12T

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice Questions

1. Linkage theory was proposed by:
(a) C.B. Bridges (b) Grigor Mendal (c) T.H. Morgan (d) H.C. Muller
2. Fluid Mosaic Model of Plasma membrane was proposed by
(a) Dobshansky (b) Singer & Nicholson (c) Novikoff (d) Palade
3. The term gene was coined by
(a) Johanson (b) Mendal (c) Jacob & Monod (d) Bateson & Punnett
4. Who was awarded Nobel Prize for Apotosis
(a) Kornberg (b) Khorana (c) Roslind Franklia (d) Sydney Brenner

B. Match the Following

- | | |
|-------------------|---------------------|
| 5. Suicidal bag | Paramecium |
| 6. Balbiany rings | Y chromosome |
| 7. Holandric gene | Lysosome |
| 8. Kappa particle | Polytene chromosome |
| | Ribosome |
| | X chromosome |

C. Fill in the blanks

9. _____ is the type of enzyme present in lysosome.
10. Nucleosome contain _____ no. of histones.

11. Down syndrome is caused by _____.
12. Philadelphia syndrome is caused by translocation of _____ and _____ chromosomes.

D. True or False

13. Klinefelters syndrome is caused by trisomy of 18 chromosome.
14. Barr body is found by Euchromatization of Y chromosome.
15. Capping is a process by which Poly U is added to mRNA.
16. The total % of RNA in a haploid chromosome is C-value.

E. Name the following

17. Name the scientist who cloned Dolly.
18. Expand GERL.
19. Pataus scheme of Human Karyotype is adopted in which conference?
20. A termination codon of transcription. (20 x 0.25 = 5)

II. Short Answer:

21. What are the characteristic features of Multiple alleles?
22. What are the functions of lysosomes?
23. What is the role of G protein in cell communication?
24. What is cis-trans splicing?
25. Explain salient features of Genetic code.
26. What are jumping genes? Comment their functions. (6 x 1 = 6)

III. Short Essay:

27. What is sex linked inheritance? Explain with suitable examples.
28. Explain post-transcriptional change of mRNA.
29. What are the stages in Prophase I of meiosis? Describe the events. (3 x 2 = 6)

IV. Long Essay

30. Give a detailed account of the structure and chemical organisation of ribosomes. OR
Give an account of the mechanism of transmembrane transport across the plasma membrane.
31. Give an account of Molecular Basis of Gene Mutation. OR
Explain gene regulation with reference to lac operon. (2 x 4 = 8)

MODEL QUESTION PAPER

FIFTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Core Course VII – CELL BIOLOGY & GENETICS

Code: ZO5B12

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice Questions

- Which is the universal donor
(a) $I^O I^O$ (b) $I^A I^O$ (c) $I^B I^O$ (d) $I^A I^B$
- Which of the following is a holandric trait?
(a) Sickle cell anemia (b) Hypertrichiosis (c) Club foot
(d) Phenyl ketoneuria
- Which is a polygenic trait?
(a) Human skin colour (b) Haemophilia (c) Frame shift mutation
(d) Widow's peak
- Organelle involved in ribosome synthesis
(a) Nucleolus (b) Chromatin (c) Mitochondria (d) Nuclear membrane

B. Match the Following

- | | |
|-------------------------|-----------------------|
| 5. Korenberg | Barr Body |
| 6. Rosalind & Franklein | Peroxisome |
| 7. Tylor woods | X-ray crystallography |
| 8. Mary Lyon | Codon deciphering |
| | Electrophoresis |
| | Chromatography |

C. Fill in the blanks

9. Spreading of cancer is known as _____.
10. Initiation codon _____
11. Egg albumin gene is a typical example for _____.
12. Total % of DNA in a haploid cell is not unique - that condition is called

D. True or False

13. Genic Balance Theory was proposed by T.H. Morgon.
14. One-gene one-polypeptide hypothesis was proposed by Jacob & Monad.
15. RNA polymerase is the enzyme needed for transcription.
16. Nucleotides are connected by phospho-di-ester bond.

E. Name the following

17. Name the specific activity of $F_1 F_0$ particle.
18. Name the primary vesicles secreted by the golgi bodies.
19. In germinating seeds lipids are converted to carbohydrates by which organelle?
20. Name the type of chromosome seen in the salivary glands of dipterans.

(20 x 0.25 = 5)

II. Short Answer:

21. Enumerate the functions of centriole.
22. Explain the cellular changes during aging.
23. What are proteasomes? What is the function?
24. Explain reverse transcription with an example.
25. Explain genic balance theory.

26. Give an account on mitochondrial genome.

(6 x 1 = 6)

III. Short Essay:

27. What are the modifications of plasma membrane?
28. What are the contributions of Nirenberg & Khorana?
29. What is sex linked inheritance? Give an example.

(3 x 2 = 6)

IV. Long Essay

30. What is crossing over? Explain the mechanism and the factors influencing crossing over. OR

Describe the structure and functions of lysos

(2 x 4 = 8)

- (d) last segment of vertebral column.
11. The enzyme associated with repair of errors in DNA during replication while proof reading:
- (a) DNA polymerase II (b) RNA polymerase
(c) helicase (d) Topoisomerase.
12. The net amount of ATP liberated as substrate level phosphorylation in glycolysis
- (a) 4 (b) 2 (c) 36 (d) 38

D. True or False

13. Hypothalamus is the master endocrine gland.
14. Epinephrine is a neurotransmitter.
5. NAD is the first identified co-enzyme.
16. Actin and myosin are contractile proteins.

E. Match the following:

- | | |
|------------------------|---|
| 17. Agglutination | Arginine phosphate |
| 18. Gas formation | I st Messenger |
| 19. Cyclic AMP | Vertebrate muscle |
| 20. Creatine phosphate | II nd Messenger |
| | Antigen antibody interaction |
| | Flatulence (20 x 0.25 = 5) |

II. Short Answers:

21. Give an account of hypothalamic releasing and inhibiting hormones.
22. Write down any four factors influencing enzyme action.
23. Explain with sketch the clove leaf model of tRNA.
24. Describe allosteric inhibition. Mention its biological role with an example.
25. What is a transition state of an enzyme? Write a note on the importance of enzyme-substrate complex and the role of an enzyme in a biological reaction.
26. Define fermentation. Mention an example from your everyday life. What are the end products of fermentation and mention the biological significance of fermentation. (6 x 1 = 6)

III. Short Essays:

27. Give an account of protein metabolism.

28. What are amino acids? Classify them.
29. Give an account of hypothalamic hypophysical interaction. (3 x 2 = 6)

IV. Long Essays:

30. Give an account on TCA cycle and add a note on its significance.

OR

What are carbohydrates? Explain the different classes of carbohydrates and their biological significance. Briefly mention any one of the analytical techniques used in the identification of the different carbohydrates.

31. Write in detail the mechanism of hormone action at different levels.

OR

Describe the structure of B-DNA and its biological significance. Briefly describe the chemical interactions among different constituents in DNA and its role in the maintenance of its structure. (2 x 4 = 8)

MODEL QUESTION PAPER

SIXTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Core Course IX - BIOCHEMISTRY, PHYSIOLOGY AND ENDOCRINOLOGY

Code: ZO6B16T

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill up the blanks:

1. Cyclic conversion of Ammonia to Urea in liver is _____.
2. Swelling of a tissue is _____.
3. Fats are mixtures of _____.
4. Denovo synthesis of carbohydrates are known as _____.

B. Name the following:

5. Name the moulting hormone in insects.
6. Name a bioluminescent fish.
7. Synthesis of glycogen from non sugars.
8. The enzyme involved in transcription of Eukaryotes.

C. Multiple Choice

9. Anorexia nervosa is an abnormal condition associated with
(a) Digestive system (b) Nervous system
(c) Muscular system (d) Excretory system.
10. A person with AB blood group can receive blood from:
(a) Both A and B group (b) both A and AB group
(c) all blood group except 'O' group (d) All blood groups
11. The carbohydrate molecule that is not a reducing one is
(a) Glucose (b) Fructose (c) Maltose (d) Sucrose
12. Identify the amino acid which is positively charged?

(a) Histidine (b) Valine (c) Lysine (d) Glutamic acid

D. True / False

13. Glucose is a reducing sugar.
14. All proteins are enzymes.
15. Mature mammalian RBC's are nucleated.
16. Carbohydrates provide the structural framework of cell membranes.

E. Match the following:

- | | |
|-----------------------------|--------------|
| 17. Lock and key hypothesis | Epinephrin |
| 18. β -oxidation | Muscle |
| 19. Neurotransmitter | Nerve |
| 20. Sarcomere | Emil Fischer |
| | Fat |
| | Protein |
- (20 x 0.25 = 5)

II. Short Answers:

21. The diagnosis of diabetics can be done by heating the urine with equal volume of Benedict's reagent. What will be the result? What is the reason for your comment? Describe the principle behind the reaction and mention some other components that also can give the same results.
22. Different types of neurological cells with examples.
23. A person who faces emergency, shows high heart rate and breathing rate. Name the factors involved to generate such a condition. Describe the cellular mechanism involved in. How the emergency signals are transmitted to the cell and helps in the liberation of energy?
24. Write down any four biological functions of protein.
25. A breast feeding mother hears the sound of her baby. What will be her response? Name the hormones associated with it. How its release is regulated?
26. Explain induced fit hypothesis. (6 x 1 = 6)

III. Short Essays:

27. What are reducing sugars? Mention one example each for reducing and non-reducing sugars. How a reducing sugar can be analysed? Mention the principle and procedure for any one suitable method.
28. Role and structure of ATP molecule.
29. Explain biochemistry of muscle contraction. (3 x 2 = 6)

IV. Long Essays:

30. What are proteins? Comment on the structure and functions of proteins.

OR

Write in detail the osmotic and ionic regulation in aquatic animals.

31. Explain the EM structure of muscle fibres and explain the physiology and biochemistry of muscle contraction. (2 x 4 = 8)

MODEL QUESTION PAPER

THIRD SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology [Core]

Core Course III – ANIMAL DIVERSITY: CHORDATA Part I

Code: ZO3B05

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A) Multiple choice:

1. Neoteny is exhibited by
a) *Branchiostoma* b) *Ambystoma* c) *Stegostoma* d) *Phrynosoma*
2. *Macropus* belongs to the order
a) Edentata b) Pholidota c) Marsupialia d) Monotremata
3. Which of the following is a living fossil?
a) *Scoliodon* b) *Sphenodon* c) *Bufo* d) *Archaeopteryx*
4. Choose the extinct bird from the following
a) *Rhea* b) *Casuaris* c) *Raphus* d) *Apteryx*

B) Match the following:

- | A | | B |
|---------------------|-----|-------------|
| 5. <i>Doliolum</i> | ___ | Caudata |
| 6. <i>Chimaera</i> | ___ | Squamata |
| 7. <i>Necturus</i> | ___ | Apoda |
| 8. <i>Chamaeleo</i> | ___ | Holocephali |
| | ___ | Thaliacea |

C) State whether the statement is true or false:

9. Third ventricle is the cavity of cerebrum.
10. *Didelphis* is a viviparous mammal.
11. Ninth vertebra of frog is amphicoelous.

12. Foramen magnum is the posterior opening of the skull.

D) Answer in a word or a phrase or a sentence:

13. What is meant by retrogressive metamorphosis?

14. Name a poisonous mammal.

15. What is meant by diphyodont dentition?

16. Give the scientific name of our National bird.

E) Fill in the blanks:

17. _____ is the larva of *Petromyzon*.

18. The gap between the incisors and premolars in the jaw of rabbit is _____.

19. The binomen of African forest elephant is _____.

20. _____ is a freshwater crocodile. (20 x 0.25 = 5)

II. Short Answer

21. Enumerate any four salient features of the phylum Chordata.

22. Give a brief account of the distribution of lung fishes.

23. Write a note on *Rhacophorus*.

24. Justify the inclusion of *Oikopleura*, *Doliolum* and *Ascidia* in the same Subphylum.

25. Draw a labelled diagram of the typical vertebra of frog.

26. Distinguish between corpus callosum and corpus striatum. (6 x 1 = 6)

III. Short Essay

27. Give an account of pulmonary respiration in frog.

28. What are the diagnostic features of the class Reptilia?

29. Briefly explain the affinities of *Archaeopteryx*. (3 x 2 = 6)

IV. Long Essay

30. Describe the digestive system of rabbit. Add a note on its nutrition.

OR

With the help of a diagram describe the arterial system of frog.

31. With the help of a diagram describe the structure of the heart of rabbit.

OR

With the help of a diagram describe the respiratory system of frog.

(2 x 4 = 8)

MODEL QUESTION PAPER

FOURTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology [Core]

Core Course IV – ANIMAL DIVERSITY CHORDATA Part II:

Code: ZO4B07T

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A) Multiple choice:

- The order to which *Hylonomus* belongs is
a) Chelonia b) Rhynchocephalia c) Crocodilia d) Squamata
- Which of the following is a nest parasite?
a) *Alcedo* b) *Eudynamus* c) *Dinopium* d) *Apteryx*
- Neoteny is exhibited by
a) *Protopterus* b) *Ambystoma* c) *Ascidia* d) *Myxine*
- Wheel organ is met with in
a) *Branchiostoma* b) *Petromyzon* c) *Ascidia* d) *Mugil*

B) Match the following:

- | A | | B |
|--------------------|-----|------------------|
| 5. Atrium | ___ | <i>Sphenodon</i> |
| 6. Slime gland | ___ | <i>Myxine</i> |
| 7. Prehensile tail | ___ | <i>Chelone</i> |
| 8. Plastron | ___ | <i>Ascidia</i> |
| | ___ | <i>Chamaeleo</i> |

C) State whether the statement is true or false:

- Tachyglossus* is a poisonous mammal.
- Foramen ovale is an interauricular aperture in the heart of rabbit.
- Crocodile has a four chambered heart.

12. Frog has an external auditory meatus.

D) Answer in a word or a phrase or a sentence.

13. Name a carnivorous mammal which gives ivory.

14. Mention the order to which *Rhinoceros* belongs.

15. Give the scientific name of ostrich.

16. What is diastema?

E) Fill in the blanks.

17. The tongue of *Petromyzon* is specialized for _____.

18. _____ is the scientific name of wild boar.

19. Male frog has _____ for amplexus with the female in mating.

20. _____ is an Ape found in India. (20 x 0.25 = 5)

II. Short Answer

21. Give an outline classification of living amphibians.

22. Mention the importance of caecum in the gut of rabbit.

23. Comment on the significance of *Latimeria*.

24. Justify the inclusion of *Ichthyophis*, *Necturus* and *Rhacophorus* under the same class.

25. Draw a labelled diagram of the eighth vertebra of frog.

26. Mention the peculiarities of dentition in rabbit. (6 x 1 = 6)

III. Short Essay

27. Give an account of *Ascidia*.

28. Enumerate four salient features of the subphylum Vertebrata.

29. Draw a labeled diagram of the ventral view of the brain of frog. (3 x 2 = 6)

IV. Long Essay

30. Explain the arterial system of frog.

OR

Explain the respiratory system of rabbit.

31. With the help of a diagram, describe the urino-genital system of male rabbit.

OR

With the help of a diagram describe the urino-genital system of female frog.

(2 x 4 = 8)

MODEL QUESTION PAPER

SIXTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology(Core)

Core Course XI - REPRODUCTIVE BIOLOGY, DEVELOPMENTAL BIOLOGY
AND TERATOLOGY

Code: ZO6B19T

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

- I. Objective type questions (each question carries a weightage of 0.25)
- (a) Fill up the blanks:**
1. Skin is an _____ derivative.
 2. Cleavage in chick is _____.
 3. Jelly coat in Amphibian is _____ egg membrane.
 4. During gastrulation "rolling in" of blastomeres thro the blastopore lip is termed as _____.
- (b) Name the following:**
5. The depression found in the anterior end of the primitive groove.
 6. The mesoderm free area found in chick embryo.
 7. A chart showing the fate of organ forming areas in blastula.
 8. Name the egg covered by calcareous shell.
- (c) Multiple choice**
9. Plant cells are
(a) Pluripotent (b) Totipotent
(c) Impotent (d) Omnipotent
 10. Epigenesis is proposed by
(a) Malphigi (b) Wolf
(c) Weisman (d) Haekal
 11. Hen's egg is
(a) Centrolecithal (b) Telolecithal

- (c) Microlecithal (d) Macrolecithal.
12. Cleavage in Amphioxus ovum is
 (a) Holoblastic equal (b) Holoblastic unequal
 (c) Discoidal (d) Superficial
- (d) True or False:**
13. Parturition is the term given to the series of events bringing about the emptying of uterus.
14. The cleavage in frog is Holoblastic equal.
15. Epimorphosis is a type of regeneration involved in the replacement of lost parts of the body.
16. Chordomesoderm is a secondary organizer.
- (e) Match the following:**
- | | |
|--------------------|--------------|
| 17. Epigenesis | Primates |
| 18. Vital staining | Preformation |
| 19. Homoculus | Malpighii |
| 20. Estrous cycle | Vogt |
| | Wolf |
| | Non primates |

II. Short Answer:

21. Explain any two theories of development.
22. Patterns of cleavage (with examples).
23. Hormonal control of Amphibian metamorphosis.
24. Neurogenesis of Amphioxus.
25. Construction of fatemap in Amphibians.
26. Explain the disruptive effect of Tetratogens. (6 x 1 = 6)

III. Short Essay:

27. Define cleavage. Classify it based on plane and amount of yolk with examples.
28. With suitable development explain the salient features of 24 hours chick embryo.
29. Cell lineage studies in Planocera. (3 x 2 = 6)

IV. Long Essay:

30. What is an egg? Classify eggs with suitable examples.

OR

What is Parthenogenesis? Explain different types.

31. What is a 'Fate map'? Explain the common practices used for the construction of fate map and describe the fate map of frog with the help of a labelled diagram.

OR

Explain the mechanism of regeneration with the help of a suitable example and narrate epimorphosis and morpholaxis. (2 x 4 = 8)

MODEL QUESTION PAPER

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION

Part III – Zoology(Core)

Core Course XI - REPRODUCTIVE BIOLOGY, DEVELOPMENTAL BIOLOGY
AND TERATOLOGY

Code: ZO6B19

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

- I. Objective type questions (each question carries a weightage of 0.25)
- a. Fill up the blanks:**
1. The cell which develops into the embryo proper in man is _____.
 2. Differentiation genes in invertebrates are known as _____.
 3. Primary organizer in Amphibian development is _____.
 4. Number of somites found in 33 hour of chick incubation is _____.
- b. Name the following:**
5. The opening through which the sperm enters the insect egg.
 6. The vertebrate gene responsible for differentiation.
 7. The parthenogenesis seen in cladocerans.
 8. The period of development of foetus within the uterus of the mother.
- c. True / False**
9. Amnion is a shock absorber.
 10. Liquid petroleum gas is used as a preservative in cryopreservation.
 11. Torsion is the bending of the body about a transverse axis.
 12. Neural tube formation takes place in 33 hour chick embryo.
- d. Multiple choice**
13. Spiral cleavage is seen in
(a) Planocera (b) Amphioxus (c) frog (d) chick

14. Blastula in frog is
 (a) coeloblastula (b) discoblastula
 (c) Eccentric coeloblastula (d) blastocyst).
15. The tissue that function as endocrine gland
 (a) corpus haemorrhagicum (b) corpus luteum
 (c) corpus albicans (d) corpora allata.
16. Human placenta based on histological intimacy is
 (a) Endotheliochorial (b) Syndesmochorial
 (c) Haemochorial (d) Haemoendothelial.

e. Match the following:

- | | | |
|-----------------------------|----------------------|-----------------|
| 17. Cell lineage | Wilhem Roux | |
| 18. Sinistral spiral | Planocera | |
| 19. Double gradient | Charles Otis Whitman | |
| 20. Experimental embryology | August Weismann | |
| | Annelids | |
| | Horstadius | (20 x 0.25 = 5) |

II. Short Answer

21. Give an account on regeneration.
22. Difference between Totipotency and Pluripotency with suitable examples.
23. Structure of Graffian follicle.
24. Comment on different methods of prenatal diagnosis.
25. Explain hen's egg with suitable diagram.
26. What are stem cells? Comment on its application. (6 x 1 = 6)

III. Short Essay

27. Give an account on Speman's constriction experiments.
28. Write a note on different types of blastula with suitable diagrams.
29. Comment on different types of implantation with neat and labelled diagrams. (3 x 2 = 6)

IV. Long Essay

30. What is gastrulation? Explain the morphogenetic movements in Amphioxus.

OR

Comment on extraembryonic membranes in chick development with suitable diagrams.

31. Describe the development of Brain in frog with suitable diagrams.

OR

Describe the different types of placenta with examples.

(2 x 4 = 8)

MODEL QUESTION PAPER 1

SIXTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Core Course XII - BIOTECHNOLOGY, MICROBIOLOGY AND
IMMUNOLOGY

Code: ZO6B21

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill in the blanks:

1. _____ is the technology used for the preparation of monoclonal antibody.
2. _____ enzyme is used to cut DNA at a specific site.
3. _____ is used for the construction of DNA from RNA.
4. Human MHC is called _____.

B. Name the following:

5. Name the hybrid vector prepared from plasmid and λ phage.
6. AIDS causing virus is called what?
7. The term used for describing fusion of sperm and ova outside the body.
8. Name the cell type responsible for humoral immunity.

C. Match the following:

- | | |
|-------------------------|-------------------|
| 9. Terminal transferase | DNA replication |
| 10. Haematopoiesis | Fermentation |
| 11. Vector | Nitrogen fixation |
| 12. Rhizobium | pUC 18 |
| | Bone marrow |
| | Calf thymus |

D. Multiple choice. Choose the correct from the following:

13. Choose the correct temperature at which sperm are cryopreserved.
 (a) - 196°C (b) - 170°C (c) -96°C (d) -216°C
14. Antibody which can cross placenta:
 (a) IgG (b) IgM (c) IgE (d) IgA
15. The first formed antibody in a neonatal
 (a) IgG (b) IgD (c) IgM (d) IgE
16. Bacteria responsible for converting milk to curd.
 (a) *Lactobacillus* (b) *Rhizobium* sp. (c) *Acetobacter* sp.
 (d) *Clostridium* sp.
- E. True or False**
17. Vaccination is an active immunization procedure.
18. Restriction enzyme is used for joining DNA.
19. Antibiotics are primary metabolites of microorganisms.
20. Thymus is a secondary lymphoid organ. (20 x 0.25 = 5)
- II. Short Answer:**
21. Name the bacteria from which EORI is isolated?
22. What is a clone?
23. Write the name of first cloned mammal.
24. What is primary culture?
25. Name the disease caused by mismatching the Rh -ve mother and Rh +ve foetus.
26. What are antibiotics? (6 x 1 = 6)
- III. Short Essay**
27. What are adjuvants?
28. What you meant by haptens?
29. What are cell lines? (3 x 2 = 6)
- IV. Long Essay**
30. Write an essay on the vectors used in rDNA technology.OR
 What are tumour antigens? Write an essay on properties of tumors cells and immunotherapy.
31. Write an essay on Humoral and cellular immunity.OR
 Write an essay on simple and gram staining of bacteria. (4 x 2 = 8)

MODEL QUESTION PAPER 2

SIXTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology(Core)

Core Course XII - BIOTECHNOLOGY, MICROBIOLOGY AND
IMMUNOLOGY

Code: ZO6B21

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill in the blanks

1. _____ enzyme is used to join DNA.
2. SLE is a _____ disease.
3. _____ is the secondary metabolite produced by cephalosporium sp.
4. Inflammation reaction is _____ type of immune response.

B. Name the following

5. Name the bacteria incorporated in Bt Cotton.
6. Name the MHC of mice.
7. Name the virus attacking bacteria.
8. Who discovered antibiotic Penicillin?

C. Match the Following

- | | |
|-----------------------|--------------------|
| 9. Cytokine | Monodonal antibody |
| 10. S ^v 40 | Growth medium |
| 11. Luria broth | Vector |
| 12. Hybridoma | IL -2 |
| | Bacteria |
| | Enzyme |

C. Choose the correct from the following

13. YAC is prepared from
(a) Bacteria and Virus (b) Virus and Yeast
(c) Yeast and Bacteria (d) λ phage
14. Enzyme used in DNA synthesis
(a) RE (b) DNA polymerase
(c) Ligase (d) Phosphatase
15. A substance that can evoke an immune response
(a) Hapten (b) Antigen
(c) Adjuvant (d) Antibody
16. Primary metabolite of micro organism.
(a) Vitamin (b) Antibiotic
(c) Toxin (d) None of the above

E. True or False

17. Dolly is produced by Nuclear transplantation change.
18. Total cell count is a method for predicting bacterial cell growth.
19. Bioremediation is the use of micro organisms to degrade environmental pollution.
20. Foetal antigens are tumour inducers. (20 x 0.25 = 5)

II. Short Answer

21. What is a tumour?
22. What is cloning?
23. What is molecular pharming?
24. What are vaccines?
25. What is fermentation?
26. What is simple staining? (6 x 1 = 6)

III. Short Essay

27. What are transgenic animals?
28. Uses of monoclonal antibodies.
29. Define growth media. (3 x 2 = 6)

IV. Long Essay

30. Write an essay on the products of industrial fermentation.

or

Write an essay on structure and characteristics of bacteria.

31. What are MHC molecules? How they assist in immunology of grafting?

or

Write an essay on molecular markers and their uses.

(2 x 4 = 8)

MODEL QUESTION PAPERS
OPEN COURSES

MODEL QUESTION PAPER 1

FIFTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Open Course I - REPRODUCTIVE HEALTH AND SEX EDUCATION

Code: ZO5D01

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Name the following

- 1) Functional unit of kidney
- 2) Total number of bones in human body
- 3) Organism causing syphilis
- 4) Diseases spread from animals to man

B. Fill in the blanks

- 5) Pellagra is a disease caused by the deficiency of _____
- 6) Use of ionizing radiating as a part of treatment of Cancer is _____
- 7) World AIDS day is _____
- 8) Polygraphy is popularly known as _____

C. Match the following

- | | |
|----------------------|------------------|
| 9) Parturition | Forlimb bone |
| 10) Oxyhaemoglobin | Kidney |
| 11. Radio-Ulna | Oxytocin |
| 12. Bowman's capsule | Oxygen transport |
| | Hind limb bone |
| | Haemophilia |

D. Choose the correct answer

13. Site of fertilization in human being

- a) ovary b) oviduct c) vagina d) uterus
14. Grafting of tissue or organ between individuals of different species is called
 a) Autograft b) Isograft c) Xenograft d) Allograft
15. The confirmatory test used to diagnose AIDS is
 a) ELISA b) Western blot c) PCR d) none of these
16. Schizophrenia is a _____
 a) Personality disorder b) Chromosome disorder
 c) Kidney disorder d) None of the above

E. Answer True or False

17. Encephalitis is a disease affecting lungs.
18. Oxygenator is used in oxygenation of blood during open-heart surgery.
19. CVS is prenatal diagnostic method.
20. Hepatitis is transmitted through flies. (20 x 0.25 = 5)

II. Short Answer:

21. Mention hormones related to sex.
22. Describe adverse effects of smoking.
23. Pre Natal diagnostic techniques.
24. What is sex reversal?
25. Explain what is paternity test?
26. Coronary Artery Bypass Grafting (6 x 1 = 6)

III. Short Essay

27. Briefly discuss the various problems of adolescence.
28. Explain endocrine disorders of man.
29. Briefly describe assisted reproductive techniques (3 x 2 = 6)

IV. Long Essay

30. Write an essay on sexually transmitted diseases

OR

Write an essay on cancer diagnostic equipments and techniques.

31. Write an essay female reproductive cycle

OR

Write an essay on adolescent sex issues. (2 x 4 = 8)

MODEL QUESTION PAPER 2

FIFTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Open Course I - REPRODUCTIVE HEALTH AND SEX EDUCATION

Code: ZO5D01

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

- A. 1. Name the secretions of endocrine organs.
2. Number of bones in fore arm of man
3. Organism causing the disease Gonorrhoea
4. Recording of electrical changes in brain

B. Fill up the blanks

5. To initiate a heart beat _____ is used.
6. Warts on human skin is caused by _____
7. Hoarseness of sound is a warning signal of _____
8. A nerve cell is called as a _____

C. Match the following

- | | |
|--------------------------|-------------------------|
| 9. Pulse Polio | Cervix Cancer |
| 10. Islets of Langerhans | Immunological diagnosis |
| 11. ELISA | Diabetes mellitus |
| 12. Pap's smear | Muscular system |
| | Vaccination |
| | Social awareness |

D. Choose the correct answer

13. DNA finger printing
- | | |
|-------------------|-----------------------------|
| a. to know future | b. to determine chromosomes |
| c. paternity | d. a cytological technique |

14. Ultra Sound Scanning
- Brain scanning
 - Prohibited test
 - an imaging technique
 - MRI
15. Infertility
- Inability to parent child
 - Azoospermia
 - An ovulatory cycles
 - Need assistance for reproduction
16. AIDS is a
- Sexually transmitted disease
 - African disease
 - Paediatric disease
 - Genetic disease
- E. Write whether the statement is true or false**
- Liver is the largest digestive gland.
 - Hepatoma is a cardiac disease.
 - Hepatitis is a non-infections disease
 - Human cloning is practised in India. (20 x 0.25 = 5)
- II. Short Answer**
- Describe the functions of thyroid hormones.
 - Explain any one of the artificial inseminating technique
 - Pre Natal Diagnosis Act
 - Describe MRI Scanning
 - List the functions of blood plasma
 - Chromosomal mechanism of sex determination in man. (6 x 1 = 6)
- III. Short Essay**
- Menstrual cycle
 - Describe different types of organ transplant.
 - Describe various contraceptives methods. (3 x 2 = 6)
- IV. Long Essay**
- Write an essay on assisted reproductive techniques. OR
 - Describe the generation and conduction of nerve impulse.
Write an essay on different imaging techniques. OR
Write an essay on cancer (2 x 4 = 8)

MODEL QUESTION PAPER 1

FIFTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Open Course II - NUTRITION, HEALTH AND HYGIENE

Code: ZO5D02

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill in the blanks

1. Number of new cases reported in unit time is called _____
2. Chikun Guinea is spread by _____ mosquito.
3. The Causative agent of elephantiasis is _____
4. The disease caused by fungal poisoning is called _____

B. Name the following:

5. The disease caused by deficiency of protein.
6. Bacterial disease affecting human.
7. Snake Venom which is haemotoxic.
8. Microbial agent transmitted through dog bite.

C. Match the following:

- | | |
|---------------------|---------------------|
| 9. Vitamin A _____ | Scurvy |
| 10. Vitamin B _____ | Ricket |
| 11. Vitamin C _____ | Cry berry |
| 12. Vitamin D _____ | Diabetes inscupidus |
| _____ | Marasmus |
| _____ | Xerophthalmia |

D. Choose the correct answer from those given below.

13. Lathyrism is a _____
 - a. Bacterial disease

- b. fungal disease
 - c. due to food poisoning
 - d. viral disease
14. A flowing blood clot is called _____
- a. Thrombus
 - b. Plaque
 - c. Embolus
 - d. angina
15. Heart-Lung Machine is used in _____
- a. Artificial respiration
 - b. By-pass surgery
 - c. Angioplasty
 - d. diving
16. Cretinism is caused by _____
- a. Hyper thyroidism
 - b. Hypothyroidism
 - c. Hyper insulinism
 - d. Growth hormone deficiency

E. Write whether the statements are true or false.

- 17. The greater the BMI the healthier is the person.
- 18. Fibers are not to be included in food.
- 19. Occasional one day fasting is beneficial for the body.
- 20. Vegans are individuals with vegetarian and non-vegetarian food habits.

(20 x 0.25 = 5)

II. Short Answer

- 21. What is haemophilia?
- 22. What is the significance of colostrums?
- 23. What is pellagra?
- 24. Differentiate between diarrhoea and dysentery.
- 25. Peptic ulcer.
- 26. Differentiate between Diabetes mellitus type I and type II. (6 x 1 = 6)

III. Short Essay:

- 27. Explain the first aid to be given in burns.
- 28. Comment on the significance of nutrition in pregnancy.

29. Define RDA and write notes on. (3 x 2 = 6)

IV. Long Essay:

30. Vector-borne diseases of human.

31. What are the common disorders of blood.

OR

Write an essay on food toxins and food adulteration. (2 x 4 = 8)

MODEL QUESTION PAPER 2

FIFTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Open Course II - NUTRITION, HEALTH AND HYGIENE

Code: ZO5D02

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill in the blanks

1. Xenopsylla spreads germs of _____
2. Venom of Cobra is toxic to _____ system.
3. Bladder worm infected meat of pork is called _____
4. Excretion of blood in urine is _____

B. Name the following

5. An auto immune disease.
6. A food additive
7. Name the first formed milk of mother.
8. Disorder due to varicose vein of the rectal wall.

C. Match the following

- | | | |
|---------------|---|-------------------|
| 9. Cretinism | - | Hyperthyroidism |
| 10. Gigantism | - | Hypothyroidism |
| 11. Diabetes | - | Hyper pituitarism |
| 12. Goitre | - | Hypopituitarism |
| | - | Hypo insulinism |
| | - | Hypo insulinism |

D. Choose the correct answer for those given below

13. Aflatoxicosis is a _____
 - a. bacterial disease
 - b. viral disease

- c. due to fungal food poisoning
 - d. due to chemical poisoning
14. Non functioning of cardiac muscle cells due to unavailability of blood is _____
- a. angina pectosis
 - b. ischemia
 - c. myocardial infarction
 - d. atherosclerosis
15. Anorexia is _____
- a. loss of appetite
 - b. sleeplessness
 - c. deficiency disease
 - d. an endocrine disease
16. BMI is _____
- a. Basal Metabolic index
 - b. Body Mass index
 - c. Blood Mass Index
 - d. Biological Magnification Index

E. Write whether statements are true or false.

- 17. Vitamin C deficiency causes rickets.
- 18. Bilharziasis is caused by round worm.
- 19. Female anopheles mosquito causes Malaria.
- 20. Pace maker is a device to measure metabolic rate (20 x 0.25 = 5)

II. Short Answer:

- 21. What is sickle cell anemia?
- 22. What is UTI?
- 23. Write down the role of fibers in diet.
- 24. Any four characteristics of malignant cells.
- 25. What is COPD?
- 26. What is "ground-itch"? (6 x 1 = 6)

III. Short Essay:

- 27. Write down the first aid for snake bite.
- 28. Dentition in human
- 29. What is nephritis? (3 x 2 = 6)

IV. Long Essay:

30. Describe different helminthe diseases of man.
31. Write an essay on food processing and preservation.

OR

Write an essay on Cancer.

(2 x 4 = 8)

MODEL QUESTION PAPER 1

FIFTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Open Course III - APPLIED ZOOLOGY

Code: ZO5D03

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill in the blanks.

1. Cockroach is a _____ pest.
2. _____ is the insect from which commercial silk is obtained.
3. Taeniasis is caused by _____
4. Rhode island red is _____ breed of fowl.

B. Name the following

5. Which organism is responsible for ascariasis.
6. Name a monophagus pest of rice
7. Name of honey bee most domesticated in India.
8. Who elucidated bee dance.

C. Match the following

- | | |
|--------------------|----------------|
| 9. Parasite | a. Honey bee |
| 10. Harmful insect | b. Enterobius |
| 11. Scavenger | c. Dung beetle |
| 12. Pollinator | d. Dragonfly |
| | e. Sitophilus |

D. Choose the correct answer

14. *Leptocorisa* is a pest of
a) Paddy b) Coffee c) coconut d) cashew

14. _____ is a useful insect.
 a) *Xenopsylla* b) head louse c) Honey bee d) Bed bug
15. Which is a vector of plague
 a) Head louse b) house fly c) Rat flea d) Bedbug
16. Culturing of fishes is known as
 a) Mari culture b) Pisciculture c) Sericulture d) Peast culture

E. Write whether statement is true or false

17. Jamnapuri is an exotic breed of goat
18. *Helopeltis antonii* is a pest of rice.
19. India ranks 2nd position in commercial silk production.
20. Process of pasteurisation was practiced by Aristotle (20 x 0.25 = 5)

II. Short Answer:

21. Write about any 2 productive insects and
22. Define Pest
23. List 4 insect pest of coconut.
24. What is nocturnal periodism with reference to filariasis.
25. Mention 2 methods to prevent spoilage of milk.
26. What do you know about agricultural entomology. (6 x 1 = 6)

III. Short Essay:

27. Describe insect pests of stored products.
28. Distinguish between auto infection and retroinfection.
29. Explain duties of worker bee. (3 x 2 = 6)

IV. Long Essay:

30. Habits, structure, life cycle, disease, prophylaxis and control measures of *Entamoeba histolytica*.

OR

What is IPM? Describe different components of IPM.

31. Write an essay on Agricultural pest you have studied.

OR

Habits, habitat, life cycle, disease, prophylaxis and control measure of *Wuchereria bancrofti*. (2 x 4 = 8)

MODEL QUESTION PAPER 2

FIFTH SEMESTER B. Sc. DEGREE EXAMINATION, JUNE 2011

Part III – Zoology

Open Course I - APPLIED ZOOLOGY

Code: ZO5D03

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill in the blanks

1. The Germs of Dengue fever are transmitted by _____
2. Study of insects is _____
3. _____ is the insect from which commercial silk is obtained.
4. The scientific name of Pearl Oyster is _____

B. Name the following

5. The scientific name of beef tape worm
6. Name an exotic breed of cattle
7. Smallest species of Honey bee
8. Name the insect from which shell lac is obtained.

C. Match the following

- | | | |
|-------------------|---|--------------------------|
| 9. Apiculture | - | Cultivation of fish |
| 10. Sericulture | - | Rearing of silk worms |
| 11. Morigulture | - | Prawn culture |
| 12. Pisci culture | - | Practice of bee keeping |
| | - | Cultivation of Mulberry |
| | - | Culture of Pearl oysters |

D. Choose the correct answer from those given below

13. When infected female *Anopheles* mosquito bites a person numerous _____ injected into the body.
 a) Sporozoites b) Merozoites c) Trophozoites d) Parasite
14. Honey bee is an example for
 a) Parasite b) Injurious insect c) beneficial insect d) scavenger
15. An insect possesses
 a) Two pairs of legs one pair of wing
 b) Three pairs of legs and three pairs of wings
 c) Three pairs of legs and two pairs of wings
 d) Two pairs of legs and two pairs of wings
16. *Filaria* is caused by
 a) Tape worm b) Hook worm c) *Wuchereria* d) *Ascaris*

E. Write whether the statement is true or false

17. Isinglass is a milk product
18. Sunandini is an indigenous breed of cattle
19. *Leptocorisa* is a butterfly
20. Honey bees are social insects (20 x 0.25 = 5)

II. Short Answer:

21. Define an insect pest?
22. What is a parasitoid?
23. What are mud banks?
24. Importance of *Aedes* mosquito?
25. What is pasteurization?
26. Bee Pasturage? (6 x 1 = 6)

III. Short Essay:

27. Explain IPM
28. Distinguish between beef and pork tape worms.
29. Explain pearl culture? (3 x 2 = 6)

IV. Long Essay:

30. Define biological control? Explain any two successful biological control measures.

OR

Write an essay on the habits, habitat, life cycle, prophylaxis and control measures of *Plasmodium vivax*

31. Write an essay on Pearl culture

OR

Write an essay on Prawn culture and induced breeding. (2 x 4 = 8)

ELECTIVE

MODEL QUESTION PAPER 1

SIXTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Elective Course - APPLIED ENTOMOLOGY

Code: ZO6B23(E)01

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill in the blanks:

1. _____ is transmitted by *Aedes* mosquito.
2. _____ is the pest of silk worm.
3. Bee keeping is commonly known as _____.
4. _____ is the host plant of *Helopeltis antonii*.

B. Name the following:

5. The honey bee most domesticated in India.
6. The insectivorous fish used for mosquito control.
7. Pollu beetle of pepper.
8. The insect from which shellac is obtained.

C. Match the following:

- | | |
|----------------------------|---------------------------------|
| 9. Coconut mite | a. <i>Chilo infuscatellus</i> |
| 10. Sugar cane shoot borer | b. <i>Leptocoriza acuta</i> |
| 11. Rice bug | c. Apiculture |
| 12. Stifling | d. <i>Aceria guerreronis</i> |
| | e. <i>Dacus dorsalis</i> |
| | f. <i>Batocera rufomaculata</i> |

D. Choose the correct answer:

13. Male mosquito feed on
(a) blood (b) nectar (c) fruit juice (d) water
14. Members of bee colony recognize each other by
(a) smell (b) vision (c) dance (d) touch
15. Wax is secreted by
(a) worker (b) drone (c) queen (d) none
16. *Callosobruchus chinensis* is the pest of stored pulse
(a) banana (b) coffee (c) stored pulse (d) pepper

E. Write whether the statement is true or false.

17. Honey bees are social insects.
18. *Leptocoriza* is a butterfly.
19. All parasites are parasitoids.
20. Study of insect is known as entomology. (20 x 0.25 = 5)

II. Short Answer:

21. Describe the different methods of cocoon cooking.
22. Write a note on autocidal control measure.
23. How will you identify a worker bee from a drone?
24. Name four insecticides of plant origin.
25. Write down the medicinal value of honey.
26. What is an occasional pest? Give examples. (6 x 1 = 6)

III. Short Essay:

27. Integrated pest management.
28. Pests of coconut.
29. Inoculation of lac insect. (3 x 2 = 6)

IV. Long Essay:

30. Describe the biology, damage caused and control measures of *Scirpophaga incertulas* and *Spodoptera mauritia*.OR
Describe the damage caused and control measures of pests of stored products.
31. With the help of labelled diagram describe the silk glands of *Bombyx mori*.
Add a note on diseases of silk worm.OR
Define biological control. Add a note on its merits and demerits. (2 x 4 = 8)

MODEL QUESTION PAPER 2

SIXTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Elective Course - APPLIED ENTOMOLOGY

Code: ZO6B23(E)

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill in the blanks:

1. *Hippobosca masculata* is the pest of _____.
2. Bee dance was elucidated by _____.
3. _____ is the organ concerned with the secretion of silk in silk worm.
4. Scientific name of rice bug is _____.

B. Name the following:

5. Monophagous pest of rice.
6. Scientific name of tassar silk moth.
7. Pest of domestic fowl.
8. Scientific name of lac insect.

C. Match the following:

- | | |
|------------------------------|------------------------------------|
| 9. Muga silk moth | a. <i>Callosobruchus chinensis</i> |
| 10. Pulse beetle | b. <i>Antheraea assamia</i> |
| 11. Cashew stem borer | c. <i>Placaederus ferrugineus</i> |
| 12. <i>Spodoptera mauria</i> | d. Coconut |
| | e. Paddy |
| | f. <i>Bombyx mori</i> |

D. Choose the correct answer

13. Which one of the following is a pollinator?
a) dung beetle b) dragon fly c) honey bee d) *Lepisma*
14. *Nilaparvata lugens* is a pest of

MODEL QUESTION PAPER 1

SIXTH SEMESTER B. Sc. DEGREE EXAMINATION

Part III – Zoology

Elective Course - AQUACULTURE, ANIMAL HUSBANDRY AND
POULTRY SCIENCE

Code: ZO6B23(E)

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

- I. Objective type questions (each question carries a weightage of 0.25)
- A. Fill in the blanks:**
- _____ is the name of the device used for hatching fish eggs.
 - _____ is the method of injection of pituitary hormone to induce spawning.
 - _____ is an arthropodan which can be cultured as food organism in aquaculture.
 - _____ is an exotic breed of fowl.
- B. Name the following:**
- Name an exotic breed of cattle.
 - Write the scientific name of tiger prawn.
 - The hatched out young one of a fish.
 - Name one common disease of poultry.
- C. Match the following:**
- Pisciculture – cultivation of mulberry.
 - Moriculture – Culture of organisms belonging to a single species.
 - Monoculture – Cultivation of fish.
 - Composite culture – Culture of organisms belonging to different species.
– Culture of marine organisms.

D. Choose the correct answer:

13. The different trophic levels in culture system is completely used in
a) Monoculture b) long line culture c) cage culture d) polyculture
14. Depletion of oxygen in pisciculture ponds may result from
a) Less number of fish b) Parasitic infection
c) Excessive use of organic manure d) Liming
15. Breed of cattle used for dual purpose
a) Sindhi b) Kangayam c) Ongole d) Jersey
16. Mariculture is carried out in waterbodies having specific
a) salinity b) pH c) temperature d) pressure

E. Write whether the statement is true or false.

17. Ising glass is a milk product.
18. Hypophthalmichthys molitris is an exotic carp.
19. In female prawns removal of eyestalk has been reported to accelerate the growth and maturation of ovaries.
20. Pullorum is a common disease of poultry. (20 x 0.25 = 5)

II. Short Answer:

21. What is raft culture?
22. What is smoking?
23. Importance of remote sensing in fishery and fish catch.
24. What is composite culture?
25. Characteristics of purse-seine.
26. Different systems of rearing in poultry. (6 x 1 = 6)

III. Short Essay:

27. Describe the causative agent, mode of transmission and control measures of foot and mouth disease of cattle.
28. Give an account on the scope and potential of aquaculture in Kerala.
29. Comment on the importance of mud banks. (3 x 2 = 6)

IV. Long Essay:

30. Give a detailed account of mussel culture. Leave a note on artificial production of seed.

OR

Give an account of culture of Indian major carps. Comment on the species that can be used for polyculture.

31. Comment on the biochemical changes involved in fish spoilage. Briefly describe the various methods of fish preservation.

OR

Describe the various techniques involved in prawn culture. (2 x 4 = 8)

MODEL QUESTION PAPER 2

SIXTH SEMESTER B. Sc. DEGREE EXAMINATION-2013

Part III – Zoology

Elective Course - AQUACULTURE, ANIMAL HUSBANDRY AND
POULTRY SCIENCE

Code: ZO6B23(E)

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill in the blanks:

1. Prawn filtration is also known as _____.
2. The scientific name of green mussel is _____.
3. The breeders are kept in _____ for breeding happas.
4. Nagori is a _____ breed of cattle.

B. Name the following:

5. Write the scientific name of silver carp.
6. Name the organ in which growth inhibiting hormone of prawn is seen.
7. Name a dual purpose breed of cattle.
8. Mention any one of the indigenous breeds of poultry.

C. Match the following:

9. *Penaeus indicus* – Kara
10. *Penaeus monodon* – Naran
11. *Metapenaeus dobsoni* – Choodan
12. *Metapenaeus monoceros* – Poovalan

D. Choose correct answer:

13. The fastest growing Indian major carps is
a) *Catla catla* b) *Labeo rohita* c) *Labeo calbasus* d) *Cirrhina mrigala*

14. The hatched out mussel young ones are known as:
a) spat b) seed c) paars d) fry
15. The phytoplankton *Fragelaria oceanica* is the favourable diet for which of the following fish?
a) Mackeral b) Bombay duck c) Sardine d) Tuna
16. White revolution means
a) revolution of colour b) revolution in the field of milk
c) revolution of sea d) revolution of water

E. Write whether the statement is true or false.

17. Seines are encircling gears.
18. Fish maws is an alternative name given to ising glass.
19. Agar yielding sea weeds are green algae.
20. Gir is a breed of lion. (20 x 0.25 = 5)

II. Short Answer:

21. What is meant by cryopreservation of fish germplasm?
22. Describe induced spawning in mussel seed production.
23. Explain the role of sound in fish capturing.
24. Medicinal value of fish oils.
25. Describe Chinese dipnet.
26. What is meant by pasteurization? Mention two methods. (6 x 1 = 6)

III. Short Essay:

27. Comment on fungal diseases of fish.
28. Describe the construction of bund in aquaculture.
29. Describe the biochemical changes that occur during fish spoilage. (3 x 2 = 6)

IV. Long Essay:

30. Give a detailed account of fish culture. Comment on the hypophysation technique involved in it.

OR

Comment on paddy cum prawn culture.

31. Comment on different types of gears employed in fishing.

OR

Describe the scope of aquaculture in India. (2 x 4 = 8)

MODEL QUESTION PAPER 1

SIXTH SEMESTER B. Sc. DEGREE EXAMINATION-2013

Part III – Zoology

Elective Course - HUMAN GENETICS

Code: ZO6B23(E)01

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill in the blanks:

1. Cri-du-chat syndrome is caused by _____
2. One gene, one polypeptide hypothesis is proposed by _____
3. An example for auto immune disease is _____
4. Oncogenes are _____

B. Name the following:

5. Gene pool
6. Fragile X Syndrome
7. Dosage compensation
8. Down's syndrome

C. Match the following:

- | | | |
|--------------------------|---|-------------------------------|
| 9. Identical twin | - | XXY + AA |
| 10. Klinefelter syndrome | - | Monozygote |
| 11. Human genome project | - | Pre natal diagnosis |
| 12. Pedigree analysis | - | Detection of genetic diseases |
| | - | Genome analysis |

D. Choose the correct answer:

13. Genic balance theory was proposed by
(a) W.S. Sutton (b) Hugo de Vries (c) C.B. Bridges (d) T.H. Morgan.

14. Monoclonal antibodies are
(a) Single line origin (b) Myeloma with lymphocyte
(c) Antibody formation (d) All the above.
15. Dosage compensation illustrated by:
(a) M.F. Lyon (b) Wobble (c) Watson & Crick (d) Mendel
16. Initiation codon is
(a) AAA (b) AUG (c) UUU (d) GAT

E. Write whether the statement is True or False

17. Nicking enzymes are called endonucleases.
18. Giesma stain is used for G-banding.
19. Lac-operon is best explained in E. coli.
20. Amniocentesis is used for determination of sex in embryo.

(20 x 0.25 = 5)

II. Short Answer:

21. What is karyotyping? What is its significance?
22. What is meant by MHC?
23. How can you explain the inheritance of Schizophrenia?
24. What are the test tube babies?
25. Mention the application of pharmacogenetics.

26. What is meant by genetic drift? (6 x 1 = 6)

III. Short Essay:

27. Write an account of cystic fibrosis.
28. Describe the biology of fixinning.
29. Give brief account of mitochondrial genes. (3 x 2 = 6)

IV. Long Essay:

30. Give an account of Twin study, its significance in the field of Genetics.
OR

Explain the genetic component of human behaviour.

31. Give an account of different methods of gene therapy. Mention the advantages and disadvantages. OR

Explain the methods of genetic counselling. Explain the psychodynamics of Genetic counselling. (2 x 4 = 8)

MODEL QUESTION PAPER 2

SIXTH SEMESTER B. Sc. DEGREE EXAMINATION-2013

Part III – Zoology

Elective Course - HUMAN GENETICS

Code: ZO6B23(E)01

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Fill in the blanks:

1. Name one X-linked dominant disorder _____.
2. Deficiency of 5-alpha reductase causes _____.
3. Programmed cell death is called _____.
4. Y linked inheritance is called _____ inheritance.

B. Name the following:

5. Amino centesis.
6. Detection and separation of protein.
7. Polygenic inheritance – One example.
8. Deciphering of genetic code is done by two scientists. Name them.

C. Match the following

- | | | |
|--------------------|---|------------------------------|
| 9. Cystic fibrosis | - | Cleaved Zygote |
| 10. Fragile X | - | Genetics Engineering |
| 11. Fraternal twin | - | Chromosomal abnormality |
| 12. Gene therapy | - | Autosomal recessive |
| | - | Autosomal dominant disorder. |

D. Choose the correct answer:

13. In Patau's scheme X chromosome belongs to which of the following:
(a) D group (b) C group (c) G group (d) E group

14. Apoptosis is
(a) Cell migration (b) Cell death (c) Cell division (d) Cell growth
15. Alzheimer disease is due to:
(a) Multifactorial (b) X-linked dominant
(c) Y-linked (d) Metabolic block
16. Transcription is
(a) m RNA formation (b) r RNA synthesis
(c) t-RNA formation (d) DNA polymerisation
- E. Write whether the statement is true or false.**
17. DNA polymerases are called Kornberg enzymes.
18. Chorionic villi sampling is a pre natal diagnostic test.
19. Pharmacogenetics deals with the influence of chemicals in genetic diseases.
20. Genetic engineering is the wilful manipulation of genes for the betterment of society. (20 x 0.25 = 5)

II. Short Answer:

21. What is genetic counselling?
22. What is PCR? Who discovered it?
23. Comment on DMD genes.
24. What is Ring chromosome?
25. Write short note on Ecogenetics.
26. Explain the genetic significance of fragile X-syndrome. (6 x 1 = 6)

III. Short Essay:

27. Describe the technique of amniocentesis, explain its significance in diagnosing genetic disorders citing two examples.
28. Write a short essay on Pedigree construction and its significance.
29. Comment on the genetics of human races and its significance. (3 x 2 = 6)

IV. Long Essay:

30. Briefly explain the history and nomenclature of human chromosomes. OR
Comment on three autosomal abnormalities in human being.
31. Describe the staining techniques for banding of human chromosomes. OR
Describe two different methods of pre-natal diagnosis. What is its significance? (2 x 4 = 8)

SYLLABUS
COMPLEMENTARY COURSES
1 TO 4

UNIVERSITY OF CALICUT
B.Sc. Degree Course
Complementary Course – Zoology

INTRODUCTION

The syllabus of Complementary Course in Zoology was restructured during the five-day Workshop conducted by The Board of Studies in Zoology (UG) from 19.01.2009 to 23.01.2009, and sponsored by The Kerala State Higher Education Council. Recommendations of the workshop were accepted by the BOS which took the following decisions.

The Board recommends that the revised syllabus may be implemented for the B.Sc. Degree programme of the University of Calicut, which offers Zoology as one of the Complementary subjects, with effect from the year 2009. In addition to the End-semester examination to be conducted by the University, a system of continuous evaluation through Internal Assessment by the faculty members of the Department of Zoology of the Institution concerned must be adopted for Zoology Complementary course.

Accordingly, the syllabus, the scheme of instruction and the scheme of evaluation of B.Sc. Zoology Complementary Course are modified and framed for implementation with effect from 2009 admission. The course structure includes both theory and practical components to be dealt with during the first four semesters of the programme. Accordingly there will be four Complementary theory courses and four Complementary practical courses. The practical courses are designed in such a way that they support the theory topics and also impart the basic skills on techniques expected of a zoology student.

Attempts have been made to update the syllabus by incorporating the recent trends in development in various branches of Zoology, conforming to the work load prescribed by the University.

SCHEME OF INSTRUCTION

Zoology forms one of the Complementary courses of the B.Sc. Degree programme. It is to be taught during the first four semesters of the programme. The syllabus includes Theory as well as Practical components (see Table I).

A. Theory

The total number of theory Complementary courses is four, one in each of the first four semesters. The theory course I (Code: ZO1C01) prescribed for the first semester is Animal diversity and Wild life, which is of 36 hours duration (2 hours / week). The theory course II (Code: ZO2C03) for second semester is Economic Zoology, which is of 36 hours duration (2 hours/week). The theory course III (Code: ZO3C05) for third semester is Physiology, Toxicology and Ethology, which is of 54 hours duration (3 hours/week). The theory core course IV (Code: ZO4C07) for fourth semester is Genetics & Immunology which is of 54 hours duration (3 hrs/week). All the four courses have a credit of 2 each. Topics for Seminar / Assignments are given separately and are meant for internal assessment alone.

B. Practical

The practical paper is of 144 hrs (2 hours/week/ semester) and consists of practicals relating to theory courses. ZO1C02(P), ZO2C04(P), ZO3C06(P) and ZO4C08(P). External practical examinations will be held only at the end of fourth semester. A candidate who appears for the practical examination must submit an authentic record of work done by him/her.

C. Record

Hand-drawn sketches of whole animals (both macroscopic and microscopic) are compulsory. The record should contain the scientific name, phylum and class, (for vertebrates order also) of the specimens with notes on identifying features and zoological importance, if any. Diagrams of type animals which are dissected must be drawn to show morphology. Hand-drawn sketches of dissections, mountings and sections also must be given.

The scheme of instruction is shown in Table I. Detailed syllabus attached.

SCHEME OF EVALUATION

The evaluation process consists of two phases (Table II).

1. Continuous evaluation through Internal Assessment

The internal evaluation will be a continuous process. It will be done by the faculty members of the department of Zoology of the Institution where the candidate is pursuing the study. It will be based on the student's attendance, performance in class tests / term examination, performance in seminars and

practicals and submission of assignments and records. Internal evaluation constitutes 25% of the grade.

A. Theory

Same as for core course.

Practical

Same as for core practical.

2. End-Semester Examination

The end semester examination will be conducted by the University. Scheme of evaluation (Table II).

A. Theory

Examination for each Complementary course will be held at the end of each semester. Question papers for the conduct of theory examinations shall be set by paper setters appointed by the University, preferably from outside the University. The answer scripts shall be valued by external examiners from within the University appointed by the University. Duration of the examination is three hours. Maximum weightage for each theory course is 25 [Refer Table III of Core Course).

B. Practical

One Complementary course Practical examination at the end of fourth semester. The question papers for the conduct of practical examinations will be set by the Board of External Examiners from within the University. The practical examination will have to be conducted by a team of two examiners on external and one internal. A duly attested record must be submitted by the candidate at the time of practical examination. Duration of examination is 3 hours. The maximum weightage for practical course is 25 (Refer Table IV of Core Course).

TABLE I
SCHEME OF INSTRUCTION

B.Sc. Zoology Complimentary w.e.f. 2009 admission

Semester	Complimentary Course	Code	Course Content	Instructional hours/ week	Instructional hours/ semester	Credit
I	Theory I	ZO1C01	Animal diversity and Wild life	2	36	2
	Practical I	ZO1C02(P)	Practical relating to Theory ZO1C01	2	36	--
II	Theory II	ZO2C03	Economic Zoology	2	36	2
	Practical I	ZO2CE	Practical relating to theory ZO2C01	2	36	--
III	Theory III	ZO3C01	Physiology, Toxicology, Ethology	3	54	2
	Practical I	ZO3CE	Practical relating to theory ZO3C01	2	36	--
IV	Theory IV	ZO4C01	Genetics & Immunology	3	54	2
	Practical I	ZO4CE	Practical relating to Theory ZO4C01	2	36	4

TABLE II**SCHEME OF EVALUATION****B.Sc. ZOOLOGY COMPLEMENTARY w.e.f. 2009 ADMISSION**

Semester	Complementary Course Code	Name of Course	Theory		Practical		Weightge for External Examination		Duration of Examination
			Internal Evaluation	External Evaluation	Internal Evaluation	External Evaluation	Internal	External	
							5	25	
I	ZO1C01	Animal divrsity & Wildlife	25%	75%			5	25	3 Hrs
II	ZO2C03	Economic Zoology	25%	75%			5	25	3 Hrs
III	ZO3C05	Physiology, Toxicology, Ethology	25%	75%			5	25	3 Hrs
IV	ZO4C07	Genetics & Immunology	25%	75%			5	25	3 Hrs
	ZO4C(P)	Practical ZO1C02 (P)+ ZO2C04(P) + ZO3C06(P) + ZO4C08(P)			25	75	5	25	3 Hrs

SYLLABUS

First Semester B. Sc. Degree Programme

Complementary Course I – Theory

ANIMAL DIVERSITY & WILD LIFE

Code: ZO1C01

(36 hours) (2 hours per week) (Credits - 2)

A. Animal Diversity **30 hrs**

The study of animal diversity is based on types with emphasis on structural organisation and classification down to classes with examples.

I. Type for detailed study **18 hrs**

1. *Penaeus* (6 hrs) Exclude details of larval stages).
2. *Oryctolagus* (12 hrs) [Exclude skin, skull bones, arterial system, venous system, lymphatic system, autonomous nervous system and endocrines system].

II. Classification **12 hrs**

An outline of 5 kingdom classification.

Kingdom: *Protista*: Salient features, classification including sub kingdom. Names only. Special reference on sub kingdom with salient features Eg:- *Noctiluca* & *Vorticella*.

Kingdom Animalia (Only salient features, mention classes)

Phylum Porifera Eg: *Leucosolenia*

Phylum Coelenterata Eg: *Obelia*

Phylum Platyhelminthes Eg: *Fasciola*, *Schistosoma*

Phylum Aschelminthes Eg: *Ascaris*

Phylum Annelida Eg: *Arenicola*, *Hirudinaria*

Phylum Arthropoda Eg: *Limulus*, *Peripatus*, *Sacculina*
Eupagurus *Belostoma*

3. Kotpal, R.L. *Modern Text Book of Zoology* Rastogi Publi. *Vertebrate & Invertebrates*
4. Soper, R. *et al. Biological Sciences*, Cambridge University Press.
5. Rajesh Gopal. *Wild life Biology*.
6. Ekambraanatha Ayyar, M. & Ananthkrishnan, T.N. *Manual of Zoology*, Vol. I (Part I & II), S. Viswanathan, Madras.
7. Encarta: 2004 Edn or earlier versions (CDs), Microsoft.
8. Encyclopedia Beritannica: 2004 Edn. or earlier versions (CDs), Britannica.com.India.
9. Ahluwalia,V.K. and Sunitha Malhotra-*Environmental Science*,Ane Books Pvt.Ltd.

<http://www.ucomp.berkeley.edu>.

<http://www.mbl.edu>.

<http://phylogeny.cornell.edu>

<http://www.ent.castate.edu>.

COMPLEMENTARY COURSE I: PRACTICAL I

(Code: ZO1C02(P))

36 hrs

A. Animal Diversity

Phylum Protozoa : *Noctiluca*, *Vorticella*

Phylum Porifera : *Leucosolenia*

Phylum Coelenterata : *Obelia*, *Physalia*, *Rhizostoma* (Any 2).

Phylum Platyhelminthes : *Fasciola*

Aschelminthes : *Ascaris*

Annelida : *Chaetopterus* / *Arenicola*, *Hirudinaria*.

Arthropoda : *Peripatus*, *Eupagarus*, *Belostoma*, *Limulus*, *Sacculina* (Any 3).

Mollusca : *Chilon*, *Sepia/ Loligo*, *Octopus* (Any 2)

Echinodermata : *Asterias*, *Holothuria*.

Phylum Chordata :

Prochordates: *Ascidia/ Branchiostoma*.

Cyclostomata: *Petromyzon*.

Suuperclass Pisces: *Narcine*, *Echeneis*, *Hippocampus*, *Heteropneustes*, *Anguilla*
(Any 3)

Class Amphibia : eg. *Ichthyophis*, *Axolotl* larva, *Rhacophorus* (Any 2)

Class Reptilia : eg. *Chamaeleon*, *Daboia/ Bungarus*

Class Aves. eg: *Columba*

Class Mammalia: *Pteropus* or any other Bat.

B. Histology : Study of the T.S. of *Hydra*, *Ascaris*, Earth worm (through typhlosolic region).

C. Osteology : Dentition (Rabbit), Pectoral and Pelvic girdles.

SYLLABUS

Second Semester B.Sc. Degree Programme

Complementary Course II - Theory

ECONOMIC ZOOLOGY

Code: ZO2C03

(36 hours) (2 hours per week) (Credits - 2)

- I. Parasitism in relation to man** **12 hrs**
1. Introduction, classification of parasites and hosts 3 hrs
(Obligatory, facultative, permanent, temporary, external, internal, and hyper parasites and parasitoid; definitive, intermediate, carrier and reserve hosts).
2. Infection and infestation (1 hr). Mention Hyperinfection and Auto infection.
3. Modes of infection (2 hr)
Inoculative, contaminative direct and retroinfection.
4. Human Parasites (7 hrs)
Entamoeba histolytica, *Taenia solium*, *Schistosoma haematobium*
Ancylostoma duodenale, *Wuchereria bancrofti* and *Enterobius vermicularis*
- II. Insects in relation to man (12 hrs)**
- Insect Pests** (4 hrs)
1. Introduction, Definition of Pests, Kinds of Pests, Causes of pest out break.
Nature of damage to host plants and control measures of the following pests
(Exclude structure and Life history of Pests).
- a) *Spodoptera* sp. (rice swarming caterpillar)
- b) *Leptocorisa* sp. (rice bug)
- c) *Rhynchophorus* sp. (red palm weevil)
- d) *Opisina* sp. (Black headed caterpillar, mention biological control)

- e) *Aceria* sp. (Coconut mite)
 - f) *Helopeltis* sp. (tea bug)
 - g) *Cosmopolites* sp. (Banana rhizome weevil)
 - h) *Dacus* sp. (Fruit fly)
 - i) *Batocera* sp. (Mango stem borer)
 - j) *Sitophilus* sp. (rice weevil)
 - h) *Callosobruchus* sp. (pulse beetle)
2. Vectors of human diseases (3 hrs)
- Insect vectors of human diseases and their control. *Anophales*, *Culex*, *Aedes*, *Xenopsylla*, *Cimex*, *Pediculus* and *Phthirus* (Diseases like malaria, filariasis, yellow fever, typhus fever, dengue, plague, chikun gunea; kala azar).
3. Insect control (3 hrs)
- Basic principles of chemical control and biological control. Integrated Pest Management (IPM) (Brief notes).
4. Useful Insects (2 hrs)
- Honey bee : social organization, importance of apiculture, bee products.
- Silk worm and lac insect: Economic importance.
- III. Aquaculture and Fishery Biology (12 hrs)**
- 1. Brief Introduction mentioning its scope in Kerala. (2 hrs)
 - 2. Pisciculture: Egg collection and hatching, induced spawning (4 hrs)
- Nursery ponds, manuring, feeding and harvesting, Ornamental fish farming (Brief account). Mention common species.
- 3. Prawn culture: Breeding and spawning of prawns, seed collection and culture, types of prawn farms, mention common species (.02 hrs).
 - 4. Mussel farming: seed collection, artificial collection of seeds, induced spawning, rearing of larvae, farming methods, harvesting (2 hrs) (brief account).

5. Pearl Culture: Preparation of nuclei, preparation of host and graft tissue, implantation, nursing (brief account). (1 hrs)
6. Fish utilization: Nutrition value, byproducts. (1 hrs)

Assignment

Teachers can suggest topics for Assignments / Seminar (for **internal evaluation only**).

1. *Chilo infuscatellus* (Sugarcane shoot borer).
2. *Platyedra gossypiella* (Pink Ball Worm).
3. *Etiella zinckenella* (Grampod Borer).
4. *Callosobruchus chinensis* (Pulse beetle).
5. *Menopon gallinae* (Shaft louse).
6. *Eomenacanthus stramineus* (Chicken louse).
7. *Hippobosca maculata* (house fly).
8. *Tabanus striatus* (horse fly).

References

- Baskaran, K.K. & Biju Kumar, A. Economic Zoology, Manjusha Publication.
- Borajah, G., Lecturers on Sericulture, 2e, 1994, SBS Pub., Banglaore.
- Nayar, K.K. *et al.* : General & Applied Entomology, TMH.
- Shukla, G.S. & Upadhyay, V.B. : Economic Zoology, 4e, 2002, Rastogi.
- Singh, S. : Bee keeping in India, ICAR.
- Singh, V.R.P. & Ramachandran, V. : Frshwater Fish culture (1985) ICAR.
- Srivastava, C.B.L. : Fishery Science and Indian Fisheries, 2002, Kitab Mahal.
- Nayar, K.K. *et al.*: General & Applied Entomology, TMH.
- Shukla, G.S. & Upadhyay, V.B. : Economic Zoology, 4e, 2002, Rastogi.
- Singh, S. : Bee keeping in India, ICAR.

COMPLEMENTARY COURSE II: PRACTICAL I

(Code: ZO2C04(P))

(36 hrs)

Study of the following parasites

Entamoeba, Trypanosoma, Plasmodium, Schistosoma, Taenia, Ancylostoma, Enterobius, Wuchereria, Hirudinaria, Cimex (Any 5).

Study of the following vectors

of the following pests

Spodoptera, Leptocorisa, Oryctes, Rhynchophorus, Opisina; Batocera, Termite Queen, Sitophilus (Any 5).

Study of following useful insects

Apis (worker) *Bombyx* female (any one)

Study of following item of Economic Importance

Perna, Pinctada, Teredo, Loligo, Penaeus, Scoliodon, Catla, Sardinella, Rastrelliger, Cybium (Any 5) .

SYLLABUS

Third Semester B.Sc. Degree Programme

Complementary Course III (Theory)

PHYSIOLOGY, TOXICOLOGY & ETHOLOGY

Code: ZO3C05

(54 hours) (3 hours per week) (Credits - 2)

Total 18 x 3 = 54

- A. Physiology (36 hrs)**
- I. Trans membrane transport mechanism **(4 hrs)**
Structure of Plasma membrane, Fluid mosaic model, Passive & Active mechanisms, vesicular transport.
- II. Nutrition: Absorption of nutrients, nervous and hormonal control of digestion, importance of fibre in the food, Anorexia, ulcer, obesity starvation and fasting (In brief). **(3 hrs)**
- III. Respiration **(4 hrs)**
Gaseous exchange, Respiratory pigments, structure and properties of haemoglobin, gas transport, control of respiration, respiratory problem, Hypoxia, Asphyxia, CO₂ poisoning or Cyanide poisoning, respiratory problem of high altitudes, problem of diving mammals, aspirators, artificial ventilation, heart lung machine, smoking and its ill effects.
- IV. Body fluid and circulation **(6 hrs)**
Blood constituents, Mention agglutination and coagulation of blood, Haemostasis, Haemolysis and Jaundice, Blood transfusion (short notes). Structure and working of heart (in Brief). Electrical and Mechanical properties of Cardiac muscle, Pacemaker and Conducting system of heart. Cardiac cycle and regulation of heart beat. Blood pressure, pulse, cardiovascular problems (brief description). Arterio sclerosis and athero sclerosis, myocardial infraction, hypertension and thrombosis.
- V. Osmoregulation & Excretion **(6 hrs)**

Osmoconformers, Osmoregulators, Water retention and Conservation in desert forms. Classification of animals based on nitrogen compounds excreted, Ammonotelism, Ureotelism, Uricotelism, Urea cycle.

Hormonal control of kidney function, Kidney disorders, renal Hyper tension, Nephritis, Renal failure, dialysis and kidney transplantation (short notes).

VI. Muscle Physiology (6 hrs)

EM structure of myofibrils and myofilament, contractile proteins different types. Chemistry and mechanism of muscle contraction, Energy supply, muscle twitch tetanus, isometric and isotonic contraction, summation of stimuli, all or none law - fatigue rigour mortis.

7. Nerve physiology (7 hrs)

Mention different types of nerve cells, glial cell, giant nerve fibre; neurotrophins excitation, impulse generation and transmission, electrochemical changes. Maintenance of resting potential, Action potential, threshold of stimulus, all or none response, synapsis, and myo neural junctions. Synaptic transmission, neuro transmitters. Scanning - MRI, CT etc.

B. Toxicology (6 hrs)

I. Toxicants and Public health hazards.

II. Toxic chemicals, Pesticides, Automobile emission, Heavy metals, fertilizers, food additives, xenobiotics, and radio active wastes.

C. Ethology (12 hrs)

Brief accounts of the following topics.

Introduction

I. History, Scope and Branches of ethology (1 hr)

II. Innate behaviour (1 hr)

Orientation, taxes and kineses, simple reflexes and instincts, drive and motivation.

III. Learned behaviour (2 hr)

Habituation, conditioned reflex, trial and error learning, latent learning, imprinting, insight learning (2 hrs)

- IV. Patterns of behaviour (2 hrs)
 Habitat selection, sexual selection, co-operation, protection, territoriality, aggression, courtship and agonistic behaviour.
- V. Biological clocks/rhythm (1 hr)
 Photoperiod, circadian rhythm, migration, navigation and homing instinct, diapause, hibernation, aestivation.
- VI. Communication in animals (1 hr)
- VII. Social organization in mammals. (2 hrs)
- VIII. Proximate factors (2 hrs)
 neurological basis of behaviour, mention hormonal, biochemical, environmental and genetic factors that influence behaviour.

Assignments

Teacher can suggest topics for Assignment / Seminar (**for internal evaluation only**).

Reference

- Berry, A.K. A Text Book of Animal Physiology. Emkay Publications, Delhi, 51.
- Chatterjee, C.C. Human Physiology. Medical Allied Agency.
- Guyton. A.C & Hall. TB of Medical Physiology, Harcourt.
- Goyal, K.A. & Sastry, K.V. Animal Physiology. Rastogi. Pub.
- Rastogi, S.C. Essentials of Animal Physiology, Wiley Eastern.
- Boinlanger, E.G. Animal Behaviour, 1994. ----- Pub.
- Reena Mather. Animal Behaviour, 1994. Rosthogi Pub.
- Sharma, P.D. Toxicology.
- Purohit, S.S. Ecology, Environment and Pollution, 2003, Agro.

COMPLEMENTARY COURSE III: PRACTICAL I

(Code: ZO3C06(P))

Section A : Physiology

(36 hrs)

1. Blood smear preparation and study of RBCs and different types of WBCs.
2. Human blood grouping – ABO and Rh systems.
3. Detection of monosaccharides, lipids and proteins.

Section B : Mounting

1. Earth worm : Setae in situ (minor), Spermatheca (minor)
2. *Penaeus* : Appendages (minor)
3. Cockroach : Salivary apparatus (major).
4. Honeybee : Mouth parts (minor).
5. Shark : Placoid scales (minor).

SYLLABUS

Fourth Semester B.Sc. Degree Programme

Complementary Course IV (Theory)

GENETICS AND IMMUNOLOGY

Code: ZO4C07

(54 hours) (3 hours per week) (Credits-2)

- 1. Human Genetics (12 hrs)**

Normal human karyotype: Classification and grouping of human chromosomes (Pataus & Denver schemes)

Chromosomal anomalies and disorders (short note only)

Autosomal anomalies : Phenyl ketonuria, Sickle cell anemia

X-linked – Haemophilia and Color blindness

Y-linked – Multiple sclerosis, Ichthyosis, Polygenic inheritance, Cleft palate or Cleft lip and diabetes mellitus.

Prenatal diagnosis

Genetic counselling.
- 2. Genetic Control of Sex (06 hrs)**

Autosomes and sex chromosomes: Mention Barr body and its significance – Chromosomal mechanism of sex determination: genic balance theory; Environmental Control of sex; hormonal influence of sex determination; sex mosaics; gynandromorphism.
- 3. Genes and gene action (08 hrs)**

Modern concept of genes, split genes, pseudogenes, overlapping and jumping genes, DNA as genetic material, Griffith experiment, Hershey and Chase experiment. One gene one enzyme hypothesis, One gene – one polypeptide hypothesis, Gene action: outline of protein synthesis.
- 4. Genetic Engineering (08 hrs)**

Definition and scope.

Methodology: Brief account of recombinant DNA technology – Brief account of enzyme involved; polymerases, nucleases, ligases.

Identification, slicing and splicing of desired genes; transfer of desired genes; direct and vector mediated plasmids, phages and bacterial genes.

Practical application, advantages and potential hazards.

5. Cytogenetics of Cancer (06 hrs)

Types of cancer: brief account of sarcomas, carcinomas, melanomas, leukemia, lymphomas, blastoma, etc.

Characteristics of cancer cell: uncontrolled multiplication, loss of contact inhibition, metastasis, reduced cellular adhesion, metaplasia, invasiveness, etc.

Origin of Cancer: mutational and viral theories, polygenic basis, hereditary dispositions.

6. Brief notes on: Protoplast fusion, hybridoma technology, monoclonal antibodies.

7. Genetics of assisted or infertility reproduction.

8. Eugenics, Euthenics and Ephenics.

IMMUNOLOGY (14 hrs)

(Brief account of the following topics)

1. Introduction: definition, antigens, natural ways of avoiding pathogens. (01 hr)

2. Immunity: Natural and acquired (active and passive) (01 hr)

3. Immune system: Organs and cells: major histocompatibility complex (02 hrs)

4. Antigen – antibody reaction: agglutination and precipitation (01 hr)

5. Immune response: Humoral and cellular immune effector mechanisms, antibodies, structure of immunoglobulin G: cytokines (02 hrs)

6. Immunodeficiency diseases: Primary and secondary types: AIDS (02 hrs)

7. Vaccines and interferons (01 hr)

8. Advanced Biological Techniques: (short not only) (04 hrs)

Southern Blotting Techniques, Northern blotting techniques, Western blotting techniques, DNA Finger printing, ELISA test.

Assignments

Teacher can suggest topics for Assignment / Seminar (for internal assessment only).

REFERENCES

Gangane, S.D.: Human Genetics, 2e, 2000, B.T. Churchill Livingstone, New Delhi.

Gordner *et al.* : Principles of Genetics, 8e, John Wiley.

Gilbert, S.C.: Developmental Biology, 5e, Sinauer Associates.

Jogchand, S.N. : Gene Biotechnology, Himalaya Publishing House.

Joshi, K.R. : Immunology 5e, 2003, Agro.

Kuby, J. : Immunology, 2e, 1994, W.H. Freeman & Co.

Mange, E.J. & Mange, A.P. Basic Human Genetics, 1999, Rastogi Pubs.

McEwen, R.S. : Vertebrate Embryology, Oxford & IBH.

Playfair, J. : Infectin and Immunity, 1995, OUP.

Ricki, L. : Human Genetics: Concepts and Application, WCB MGH.

Roitt, I.M.: Essential Immunology, 8e, 1994, Blackwell Science.

Snustand & Simmons: Principles of Genetics, 3e / 4e, Cambridge Uty. Press (LPE).

Stine, C.J. : The New Human Genetics: W.C. Brown.

Twyman : Instant notes in Developmental Biology, 2001, Viva Books.

Wise- Immunology-Blackwel

Wise – Immunology a comprehensive review – Ane books

COMPLEMENTARY COURSE PRACTICAL IV

(Code: ZO4C08(P))

Section A : Dissections

(36 hrs.)

Earth worm : Alimentary canal upto 25th segment (minor)

Penaeus : Nervous system (major)

Mullet : Alimentary canal (major)

Section B : Genetics

Study of the following (use slides / models / charts / photographs)

1. Study of sex linked inheritance (haemophilia, sickle cell anaemia, color blindness).
2. Study of normal human karyotype and abnormal karyotype (any 2).

**MODEL QUESTION PAPERS
COMPLEMENTARY COURSES**

MODEL QUESTION PAPER 1

FIRST SEMESTER B. Sc. DEGREE EXAMINATION-2013

Part III – Zoology

Complementary Course I - ANIMAL DIVERSITY AND WILD LIFE

Code: ZO1C01

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice

1. Nauplius is the larval form of
(a) Penaeus (b) Pinworm (c) Coelenterate (d) Mollusca
2. Compound eyes are seen in Phylum
(a) Coelenterate (b) Annelid (c) Arthropod (d) Aschelminthes
3. Protonephridia with flame cells are seen in
(a) Earthworm (b) Ascaris (c) Fasciola (d) Sepia
4. Water vascular system seen in
(a) starfish (b) silver fish (c) devil fish (d) jelly fish

B. Match the following

- | | |
|----------------|------------------------------|
| 5. Chiton | 1. Phylum Annelida |
| 6. Amphioxus | 2. Phylum Chordata |
| 7. Rhacophorus | 3. Phylum Mollusca |
| 8. Arenicola | 4. Phylum Arthropoda |
| | 5. Phylum Coelenterata |
| | 6. Sub Phy. Cephalo chordata |

C. Fill in the blanks

9. Peripatus exhibit _____ distribution

10. Pseudocoel is seen _____ Phylum
11. Sacculina exhibit _____
12. An organism showing polymorphism is _____

D. Write True or False

13. *Fasciola hepatica* is a monogenetic Parasite.
14. Rhabditiform larva is the larva of *Penaeus*.
15. Dead shell of sepia is commonly known as "cuttle bones"
16. Petromyzon is an example of Gnathostomata

E. Name the following

17. A fish having brood pouch
18. An amphibian which can fly
19. Scientific name of blue rock Pigeon
20. An example for egg laying Mammal (20 x 0.25 = 5)

II. Short Answer:

21. What are pouched mammals? Give an example
22. What is Petasma? Where you can see them
23. What are statocysts? Write its structure.
24. What is the stato acoustic organ of Rabbit? What is its function?
25. What is pace maker? What is its function?
26. What is coraco - scapula? Sketch and label. (6 x 1 = 6)

III. Short Essay:

27. Write the structure of a typical vertebra of Rabbit. Sketch and label the parts.
28. Write 5 important salient features of Phylum Arthropoda
29. Write an account of Sacculina (3 x 2 = 6)

IV. Long Essay:

30. Write an account of thoracic appendages of *Penaeus* with the help of diagrams.
31. Write an account of *Ascaris lumbricoides*.
Write its parasitic adaptations and pathogenic effects. (2 x 4 = 8)

MODEL QUESTION PAPER 2

FIRST SEMESTER B. Sc. DEGREE EXAMINATION-2013

Part III – Zoology

Complementary Course I - ANIMAL DIVERSITY AND WILD LIFE

Code: ZO1C01

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

I. Multiple Choice

1. Sacculina coming under the Phylum
(a) Coelenterata (b) Annelida (c) Arthropoda (d) Mollusca
2. Cellular grade of organization seen in
(a) Sponges (b) Coelenterates (c) Protozoans (d) Cnidarians
3. Syncytial epidermis seen in
(a) Fasciola (b) Leech (c) Ascaris (d) Earthworm
4. Amphioxus belongs to the sub Phylum
(a) Urochordata (b) Cephalo chordata (c) Vertebrata (d) Hemichordata

B. Match the following

- | | |
|--------------------|--------------|
| 5. Nephridia | 1. Prawn |
| 6. Antennary gland | 2. Fasciola |
| 7. Protonephridia | 3. Ascaris |
| 8. Renette cells | 4. Earthworm |
| | 5. Mytilus |
| | 6. Starfish |

C. Fill in the Blanks

9. Sexual dimorphism is exhibited by _____

10. _____ is a living fossil
11. Connecting link between Annelids and Arthropod is _____
12. True Coelom is present in _____

D. True or False

13. Parasitic castration is exhibited by *Schistosoma*
14. Physalia shows Polymorphism
15. Spicules and Spongin fibres are present in coelenterates
16. Chamaeleon has zygodactyly for grasping

E. Name the following

17. A fish having cephalic Sucker
18. A worm like, limbless, tailless, blind amphibian
19. An animal showing parasitic castration
20. Scientific name of blood fluke (20 x 0.25 = 5)

II. Short Answer:

21. Parasitic adaptations of *Fasciola hepatica*
22. Write a short note on *Physalia*
23. What are choanocytes? Where we can find them?
24. Write short notes on *Noctiluca*
25. Write what is dentition? Write the dental formula of Rabbit.
26. Sketch and label the 2nd maxilliped of *Penaecus*. (6 x 1 = 6)

III. Short Essay:

27. Write an account of cephalic appendages of *Penaecus*
28. Briefly write the working mechanism of heart with the help of a diagram.
29. Write 4 salient features of Phylum Arthropoda (3 x 2 = 6)

IV. Long Essay:

30. What are chordates? Write its important diagnostic features.
31. Write an account of the following:
(1) *Vorticella* (2) *Hirudinaria* (3) *Eupagurus* (4) *Hippocampus*
(5) Chamaeleon (2 x 4 = 8)

MODEL QUESTION PAPER 1

SECOND SEMESTER B. Sc. DEGREE EXAMINATION-2013

Part III – Zoology

Complementary Course II - ECONOMIC ZOOLOGY

Code: ZO2C03

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice

1. *Aedes* sp. of mosquito deposit eggs in
 - (a) moist soil
 - (b) flowing water bodies
 - (c) stagnant water
 - (d) fresh water.
2. Wax gland of honey bee is present in
 - (a) Hind leg
 - (b) mouth
 - (c) head
 - (d) Abdomen
3. *Culex* mosquito spread
 - (a) malaria
 - (b) yellow fever
 - (c) *Filaria*
 - (d) Sleeping sickness
4. Byssus thread is found in
 - (a) *Sepia*
 - (b) *Perna*
 - (c) Silk worm
 - (d) *Panaeus*

B. Match the Following

- | | |
|-----------------|-----------------------------------|
| 5. Miracidium | 1. <i>Wuchereria bancrofti</i> |
| 6. Rhabditiform | 2. <i>Enterobius vermicularis</i> |
| 7. Cysticereus | 3. <i>Ancylostoma duodenale</i> |
| 8. Microfilaria | 4. <i>Schistosoma haematobium</i> |
| | 5. <i>Taenia solium</i> |
| | 6. <i>Entamoeba histolytica</i> |

C. Fill in the blanks

9. Silk gland of *Bombyx mori* is modified _____ gland.
10. A high grade collagen produced from the gas bladder of fishes is _____
11. Black Pearl is cultured from _____
12. The impure lac residue derived from lac insect is _____

D. True or False

13. Queen bee substance is also known as Royal jelly.
14. *Xenopsilla* is the vector of *Pasteurella pestis*.
15. Parasites of Parasites are called hyper parasite.
16. *Batocera rufomaculata* is a pest of cashew

E. Name the following

17. The method of induced breeding in *Macrobrachium rosenbergi*
18. The Indian Pearl oyster used for Pearl culture.
19. Mention the scientific name of pulse beetle
20. The method of transmission in *Ancylostoma* ----- (20 x 0.25 = 5)

II. Short Answer:

21. Explain raft culture
22. Induced breeding used in Pisciculture
23. Write a short note on organic insecticide.
24. Economic importance of honey.
25. Write a short note on a paddy pest.
26. Transmission of cysticercus to man. (6 x 1 = 6)

III. Short Essay

27. Pathogenic effects of *Entamoeba histolytica*
28. Parasitic adaptations of endoparasites
29. Different modes of infection in Parasites. (3 x 2 = 6)

IV. Long Essay

30. Write an essay on the life cycle of *Schistosoma haematobium*
31. Write an essay on Pearl culture. (2 x 4 = 8)

MODEL QUESTION PAPER 2

SECOND SEMESTER B. Sc. DEGREE EXAMINATION- 2013

Part III – Zoology

Complementary Course II - ECONOMIC ZOOLOGY

Code: ZO2C03

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice

1. Pollen Basket in honey bees lies on
 - (a) fore leg
 - (b) hind leg
 - (c) middle leg
 - (d) hind leg and middle leg
2. Eri silk is produced by
 - (a) *Samia cynthia ricine*
 - (b) *Bombyx mori*
 - (c) *Antheraea assamia*
 - (d) *Antheraea mylitta*
3. Miraeidium is the larval form of
 - (a) Tape worm
 - (b) *Ancylostoma*
 - (c) *Enterobius*
 - (d) *Schistosoma*
4. *Rhynchophorus* is
 - (a) Paddy pest
 - (b) Coconut pest
 - (c) Mango pest
 - (d) Cashew

B. Match the Following

- | | |
|-----------------------|------------------|
| 5. <i>Ancylostoma</i> | 1. Round worm |
| 6. <i>Wuchereria</i> | 2. Pin worm |
| 7. <i>Enterobius</i> | 3. Filarial worm |

IV. Long Essay

30. Write an account of the social organization of Honey bee.
31. Write an account of the structure, life cycle and pathogenesis of *Entamoeba histolytica*. (2 x 4 = 8)

MODEL QUESTION PAPER 1

THIRD SEMESTER B. Sc. DEGREE EXAMINATION-2013

Part III – Zoology

Complementary Course III - PHYSIOLOGY, TOXICOLOGY AND ETHOLOGY

Code: ZO3C05

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice Questions

1. The hormone Pancreozymine is Secreted by
(a) Pancreas (b) Stomach (c) Duodenum (d) ilium
2. Each lung is covered by a double layered membrane called
(a) Arechnoid membrane (b) Pericardial membrane
(c) Pleural membrane (d) basilar membrane
3. The plasma protein involved in blood coagulation
(a) albumin (b) globulin (c) protamins (d) fibrinogen
4. The most toxic metabolic waste in animal is
(a) Urea (b) Uric acid (c) Ammonium (d) Allantoin

B. Match the following

- | | |
|-----------------------|-----------------|
| 5. Nephridia | Frog |
| 6. Organ of Bojanus | Prawn |
| 7. Malpighian tubules | Insects |
| 8. Antennary gland | Molluscs |
| | Annelids |
| | <i>Fasciola</i> |

C. Fill in the Blanks

9. _____ is the gastric hormone which stimulates the production of gastric juice.
10. In _____ sickness nitrogen and other dissolved gases bubbled out from blood.
11. Auriculo ventricular valves are connected to the ventricular wall by a fibrous cord called _____
12. _____ animals can withstand and survive wide range of variations in the osmotic and ionic concentrations of external medium.

D. True or False

13. Anorexia nervosa is a disorder characterised by loss of appetite.
14. Leucocytes play an active role in transport of respiratory gases.
15. In isotonic muscle contraction no movement is possible.
16. Allergy is a state of abnormally high immune response.

E. Name the following

17. A vaccine administered against tuberculosis
18. A group of compounds secreted to external environment by organism.
19. Name the protein present in thin filaments of striated muscle fibre.
20. What is pump oxygenator. (20 x 0.25 = 5)

II. Short Answer:

21. What is lunar rhythm?
22. What is hibernation?
23. What is cori cycle?
24. Mention major proteins involved in muscle contraction.
25. Role of ADH in osmoregulation.
26. What is nodal tissue? (6 x 1 = 6)

III. Short Essay

27. Write a short essay on cyanide poisoning.
28. Give an account of biological poisons.
29. What is chloride shift or Hamburger phenomenon? When does it occur? How is it significant? (3 x 2 = 6)

IV. Long Essay

30. What are nerve impulses? Explain how are they generated and transmitted?
31. Explain the heart lung machine with the help of diagram and mention its working mechanisms (2 x 4 = 8)

MODEL QUESTION PAPER 2

THIRD SEMESTER B. Sc. DEGREE EXAMINATION-2013

Part III – Zoology

Complementary Course III - ANIMAL PHYSIOLOGY, TOXICOLOGY, ETHOLOGY

Code: ZO3C05

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice Questions

- Oxygenation of haemoglobin is enhanced by
(a) high PO_2 (b) low PO_2 (c) high PCO_2 (d) low PCO_2
- BCG Vaccine administered in infants
(a) Polio (b) Hepatitis (c) Diptheria (d) Tuberculosis
- Grave's disease is
(a) Colonic disease (b) metabolic disease (c) endocrine disease
(d) other diseases
- The neurotransmitter released to synapsis is
(a) acetyl choline (b) Polycystokinin (c) Cholinesterase
(d) gastrin

B. Match the following

- | | |
|-------------------|--|
| 5. Muscle twitch | 1. Sustained and slow contraction |
| 6. Muscle tetanus | 2. loss of power for contraction |
| 7. Muscle fatigue | 3. Sum total of muscular events in contraction |
| 8. Rigor mortis | 4. Muscle become rigid and permanently contracted. |
| | 5. Continuous and fused contraction |

6. Fast short term contraction

C. Fill in the blanks

9. Striated muscles are arranged in bundles called _____
10. The chain of biochemical reactions, taking place during muscular contraction, is called _____ scheme of reaction.
11. The lowest of stimulus that can initiate muscular contraction is called _____ stimulus.
12. The degeneration of myelin sheath of neuron results in to a serious disorder called _____

D. True or False type Question

13. Muscular contraction requires high concentration of Ca^+ ions and relaxation requires low concentration of Ca^+ ions.
14. In the resting phase a nerve membrane is +ve inside and -ve outside.
15. All or non law is the concept that all stimuli cannot elicit nerve impulses.
16. 'O' group persons can receive only 'A' group blood.

E. Name the following

17. Substance which can evoke immune response in an organism is
18. The neurotransmitter released from synaptic vesicle during muscular contraction.
19. The inflammatory disorder of the kidney
20. The formation of clot within heart or unbroken blood vessel during life is

(20 x 0.25 = 5)

II. Short Answer:

21. Give two examples in which anaerobic respiration is common. Mention one site of anaerobic respiration in man.
22. What are alveoli? What is their significance?
23. What is pace maker?
24. Bony fishes are described as ammonotelic animals. Give reason.
25. What is glomerulus? What is its role?
26. What are interferons? How do they act?

(6 x 1 = 6)

III. Short Essay:

27. Explain what is meant by imprinting
28. Explain the health hazards of automobile exhaust.
29. What are synapses? Mention how synaptic transmission occur. (3 x 2 = 6)

IV. Long Essay:

30. Write the ultrastructure of a striated muscle fibre/ Explain the mechanism of muscular contraction.
31. Explain fluid mosaic model of Plasma membrane. Mention various types of transmembrane transportation. (2 x 4 = 8)

MODEL QUESTION PAPER 1

FOURTH SEMESTER B. Sc. DEGREE EXAMINATION- 2013

Part III – Zoology

Complementary Course IV - GENETICS & IMMUNOLOGY

Code: ZO4C07

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice

1. Edward syndrome is an example of
 - (a) autosomal monosomy
 - (b) sex chromosomal monosomy
 - (c) autosomal trisomy
 - (d) sex chromosomal trisomy.
2. The inborn metabolic error in which Phenylalanine accumulates in blood is called
 - (a) Alkaptonuria
 - (b) Phenylketonuria
 - (c) Albinism
 - (d) Tyrosinosis
3. Carcinoma takes its origin
 - (a) Epithelial cells
 - (b) Connective tissue
 - (c) Haemopoetic cells
 - (d) Pigment cells
4. When we get a deep wound we usually administer
 - (a) DTP vaccine
 - (b) DMR vaccine
 - (c) BCG vaccine
 - (d) AT serum

B. Match the following

- | | |
|----------------|-----------------------------------|
| 5. Interferons | 1. Hay fever |
| 6. Vaccines | 2. Antibody containing blood sera |
| 7. Antisera | 3. Anti viral glycoproteins |

8. Compliment proteins
4. Opsonization
5. Inactivated antigen
6. Rheumatic fever

C. Fill in the blanks

9. Chemical modifications and maturation of B-cells in human beings occurs in _____
10. _____ are the preparations of killed microorganism.
11. _____ cells have no powers for cellular adhesion.
12. Silent valley is ecologically important for a mammal.

D. True or False

13. Human saliva, sweat and tear contain lysozyme.
14. Sum total of codons required for the synthesis of a protein is known as cistron.
15. 'UAA' is the initiation codon in protein synthesis.
16. Carcinoma originated in connective tissue.

E. Name the following

17. The term cistron was coined by the scientist.
18. The transfer of genetic material from one bacterium to another through an agency of bacterio phage.
19. Highly heterochromatinised region of female somatic cell.
20. The chromosomal characteristic of a cell is known as (20 x 0.25 = 5)

II. Short Answer:

21. What is MHC?
22. What is "junk DNA"?
23. What are interferons? How are they significant?
24. What is gynandromorphism? Mention different types.
25. Explain what is sex index?
26. Central dogma of molecular biology. (6 x 1 = 6)

III. Short Essay:

27. Explain environmental control of sex determination.

28. Explain one gene one enzyme concept.
29. Explain quantitative theories of sex determination. (3 x 2 = 6)

IV. Long Essay

30. Differentiate Karyotype from Karyogram. Write an essay on Patau's scheme of chromosome grouping.
31. Write briefly the different stages of Protein synthesis. (2 x 4 = 8)

MODEL QUESTION PAPER 2

FOURTH SEMESTER B. Sc. DEGREE EXAMINATION- 2013

Part III – Zoology

Complementary Course IV - GENETICS & IMMUNOLOGY

Code: ZO4C07

Time: Three Hours

Maximum Weightage: 25

Answer all questions

[Answers may be written either in English or in Malayalam.]

Give illustrations wherever necessary.]

I. Objective type questions (each question carries a weightage of 0.25)

A. Multiple Choice Questions

1. Turner's Syndrome is

- (a) Testicular dysgenesis (b) Ovarian dysgenesis
(c) Mongoloid idiocy (d) Edward syndrome

2. Which one of the following is an example of biochemical mutation

- (a) Sickle cell anaemia (b) Uraemia
(c) Alkaptonuria (d) Haemophilia

3. Leukimia is

- (a) degenerative disease (b) infectious disease
(c) Cancerous disease (d) allergic disease

4. Migration of cancer cells and the spreading of tumour is called

- (a) metastasis (b) epistasis (c) melanoma (d) sarcoma

B. Match the Following

- | | |
|---------------------------|---------------------------|
| 5. Autosomal trisomy 21 | 1. Colour blindness |
| 6. Autosomal tri somy 18 | 2. Klinefelter's syndrome |
| 7. X-chromosomal monosomy | 3. Turner's syndrome |
| 8. X-chromosomal trisomy | 4. Edward's syndrome |

5. Down's syndrome

6. Haemophilia

C. Fill in the blanks

9. Rh antigen can be dangerous to a foetus born to an Rh _____ father and Rh _____ mother.
10. The inborn metabolic error _____ is characterised by the accumulation of homogentisic acid.
11. Cancers taking origin in epithelial cells are called _____
12. Basic unit of genetic code is _____

D. True or False

13. Haemophilia is expressed in alternate female generations.
14. In albinism there is excessive concentration of melanin in skin and hair.
15. Active immunity develops in response to antigenic stimulation.
16. Venom of viper is neurotoxic

E. Name the following

17. A vaccine administered against tuberculosis.
18. A group of compounds which can intensify immune response.
19. A state of dormancy during embryonic stage of an animal is
20. Name the cancer that occurs in melanocytes. (20 x 0.25 = 5)

II. Short Answer:

21. Mention the major immunological organs involved in immune system.
22. Explain what is mongolism?
23. What is acquired immunity?
24. What is antisera?
25. What is Set D?
26. What is Oncogene? Explain oncogene theory. (6 x 1 = 6)

III. Short Essay:

27. Explain humoral immunity.
28. What is amniocentesis? Explain its significance.

29. What is immunoglobulin? Explain its structure. (3 x 2 = 6)

IV. Long Essay

30. Explain the chromosomal mechanism of sex determination.

31. Evidences for DNA as the genetic material (2 x 4 = 8)