KANNUR UNIVERSITY

(Abstract)

B.Sc. Zoology Programme-Scheme, Syllabus and Pattern of Question Papers of Core, Complementary Elective and Generic Elective Course under Choice Based Credit and Semester System (Outcome Based Education System-OBE) in Affiliated colleges with effect from 2019 Admission-Implemented-Orders issued.

Academic Branch

No.Acad.C2/12649/2019 Civil Station P.O, Dated 22/06/2019

Read:- 1. U.O.No.Acad.C2/429/2017 dated 10-10-2017

2. The Minutes of the Meeting of the Curriculum Restructuring Committee held on 28-12-2018.
3. U.O No. Acad.C2/429/2017 Vol.II dated 03-06-2019
4. The Minutes of the Meeting of the Board of Studies in **Zoology (UG)** held on 06/06/2019
5. Syllabus of **B.Sc. Zoology** Submitted by the Chairperson, Board of Studies in **Zoology (UG)** dated 15/06/2019

ORDER

1. A Curriculum Restructuring Committee was constituted in the University vide the paper read (1) above to co-ordinate the activities of the Syllabus Revision of UG programmes in Affiliated colleges of the University.

2. The meeting of the Members of the Curriculum Restructuring Committee and the Chairpersons of different Boards of Studies held, vide the paper read (2) above, proposed the different phases of Syllabus Revision processes, such as conducting the meeting of various Boards of Studies, Workshops, discussion etc.

3. The Revised Regulation for UG programmes in Affiliated colleges under Choice Based Credit and Semester System (in OBE-Outcome Based Education System) was implemented with effect from 2019 Admission as per paper read (3) above.

4. Subsequently, as per paper read (4) above, the Board of Studies in **Zoology (UG)** finalized the Scheme, Syllabus & Pattern of Question Papers for Core, Complementary Elective & Generic Elective Course of **B.Sc. Zoology** Programme to be implemented with effect from 2019 Admission.

5. As per paper read (5) above, the Chairperson, Board of Studies in **Zoology (UG)** has submitted the finalized copy of the Scheme, Syllabus & Pattern of Question Papers of **B.Sc. Zoology** Programme for implementation with effect from 2019 Admission.

6. The Vice Chancellor after considering the matter in detail and in exercise of the powers of the Academic Council conferred under Section 11(1) of Kannur University Act 1996 and all other enabling provisions read together with accorded sanction to implement the Scheme, Syllabus & Pattern of Question Papers(Core/Complementary Elective/Generic Elective Course) of the **B.Sc. Zoology** programme under Choice Based Credit and Semester System(in OBE-Outcome Based Education System) in the Affiliated colleges under the University with effect from 2019 Admission, subject to reporting to the Academic Council.

7. The Scheme, Syllabus & Pattern of Question Paper of the **B.Sc. Zoology** Programme are uploaded in the University website (www.kannuruniversity.ac.in)

Orders are issued accordingly.

Sd/-
DEPUTY REGISTRAR (ACADEMIC)
For REGISTRAR

To

The Principals of Colleges offering **B.Sc. Zoology** programme

Copy to:-

1. The Examination Branch (through PA to CE)
2. The Chairperson, Board of Studies in **Zoology (UG)**
3. PS to VC/PA to PVC/PA to Registrar
4. DR/AR-I, Academic
5. The Computer Programmer (for uploading in the website)
6. SF/DF/FC

KANNUR UNIVERSITY ★ THAVAKKARA ★

Forwarded/By Order

SECTION OFFICER

KANNUR UNIVERSITY

BOARD OF STUDIES, ZOOLOGY (UG)

SYLLABUS FOR ZOOLOGY CORE,

COMPLEMENTARY ELECTIVE

& GENERIC ELECTIVE COURSES

OF BSc PROGRAMME

(2019 Admission onwards)

CBCSS-OBE

KANNUR UNIVERSITY

VISION AND MISSION STATEMENTS

Vision: To establish a teaching, residential and affiliating University and to provide equitable and just access to quality higher education involving the generation, dissemination and a critical application of knowledge with special focus on the development of higher education in Kasargode and Kannur Revenue Districts and the ManandavadyTaluk of Wayanad Revenue District.

Mission:

- To produce and disseminate new knowledge and to find novel avenues for application of such knowledge.
- To adopt critical pedagogic practices which uphold scientific temper, the uncompromised spirit of enquiry and the right to dissent.
- To uphold democratic, multicultural, secular, environmental and gender sensitive values as the foundational principles of higher educationand to cater to the modern notions of equity, social justice and merit in all educational endeavors.
- To affiliate colleges and other institutions of higher learning and to monitor academic, ethical, administrative and infrastructural standards in such institutions.
- To build stronger community networks based on the values and principles of higher education and to ensure the region's intellectual integration with national vision and international standards.
- To associate with the local self-governing bodies and other statutory as well as non-governmental organizations for continuing education and also for building public awareness on important social, cultural and other policy issues.

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UG PROGRAMME OUTCOMES

PO 1.Critical Thinking:

1. Acquire the ability to apply the basic tenets of logic and science to thoughts, actions and interventions.

2. Develop the ability to chart out a progressive direction for actions and interventions by learning to recognize the presence of hegemonic ideology within certain dominant notions.

3. Develop self-critical abilities and also the ability to view positions, problems and social issues from plural perspectives.

PO 2.Effective Citizenship:

1. Learn to participate in nation building by adhering to the principles of sovereignty of the nation, socialism, secularism, democracy and the values that guide a republic.

2. Develop and practice gender sensitive attitudes, environmental awareness, the ability to understand and resist various kinds of discriminations and empathetic social awareness about various kinds of marginalisation.

3. Internalise certain highlights of the nation's and region's history. Especially of the freedom movement, the renaissance within native societies and the project of modernisation of the post-colonial society.

PO 3.Effective Communication:

1. Acquire the ability to speak, write, read and listen clearly in person and through electronic media in both English and in one Modern Indian Language

2. Learn to articulate analysis, synthesis, and evaluation of situations and themes in a well-informed manner.

3. Generate hypothesis and articulate assent or dissent by employing both reason and creative thinking.

PO 4.Interdisciplinarity:

1. Perceive knowledge as an organic comprehensive, interrelated and integrated faculty of the human mind

2. Understand the issues of environmental contexts and sustainable development as a basic interdisciplinary concern of all disciplines.

3. Develop aesthetic, social, humanistic and artistic sensibilities for problem solving and evolving a comprehensive perspective.

Programme Specific Outcome of BSc Zoology Programme

PSO1: Skill development for the proper identification, naming and classification of life forms especially animals.

PSO2: Acquisition of knowledge on structure, life cycle and life processes that exist among animal diversity through certain model organism studies.

PSO3: Understanding of various interactions that exist among plants animals and microbes; to develop the curiosity and love on the dynamicity of nature.

PSO4: Understanding of the major elements of variation that exist in the living world through comparative morphological and anatomical study.

PSO5: Ability to explain the diversity and evolution based on the empirical evidences in Morphology, Anatomy, Embryology, Physiology, Biochemistry, Molecular Biology and Life history.

PSO6: Skill development in the observation and studyofnature, biological techniques andscientificinvestigation

PSO7: Making aware of the scientific and technological advancements in the fields of Information and Communication, Biotechnology and Molecular Biology for further learning and research.

PSO8: Internalisation of the concept of conservation and evolution through the channel of spirit of inquiry.

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BSc ZOOLOGY PROGRAMME
WORK AND CREDIT DISTRIBUTION STATEMENT

Semester	Course Title	Credits	Hours per week	Total Credits	Total Hours
I	English Common Course 1	4	5	18	25
	English Common Course 2	3	4		
	Additional Common Course 1	4	4		
	Core Course 1: Protista and Non Chordata I	3	2 + 2		
	Complementary Elective 1(Chemistry)	2	2 + 2		
	Complementary Elective 1(Botany)	2	2 + 2		
II	English Common Course 3	4	5	18	25
	English Common Course 4	3	4		
	Additional Common Course 2	4	4		
	Core Course 2: Non Chordata II	3	2 + 2		
	Complementary Elective 2(Chemistry)	2	2 + 2		
	Complementary Elective 2 (Botany)	2	2 + 2		
III	English Common Course 5	4	5	15	25
	Additional Common Course 3	4	5		
	Core Course 3: Chordata I	3	3 + 2		
	Complementary Elective 3 (Chemistry)	2	3 + 2		
	Complementary Elective 3 (Botany)	2	3 + 2		
IV	English Common Course 6	4	5	27	25
	Additional Common Course 4	4	5		
	Core Course 4- Chordata II and Comparative Anatomy	3	3 + 2		
	Complementary Elective 4 (Chemistry)	2	3 + 2		
	Complementary Elective 4 (Botany)	2	3 + 2		
	Core Course Practical 1	4			
	Complementary Elective Practical	4			
	Complementary Elective Practical	4			
V	Evolution, Ethology and Research Methodology	4	4+2	17	25
	Animal Physiology	4	4+2		
	Biochemistry and Biophysics	4	4+2		
	Genetics	3	3+2		
	Generic Elective Course	2	2		
VI	Cell Biology, Immunology and Microbiology	4	4+2	25	25
	Molecular Biology and Bioinformatics	4	4+2		
	Environmental Science	4	4+2		
	Developmental Biology	3	3+2		
	Core Practical II	4			
	Core Practical III& Field study	4			
	Project	2	2		
Total				120	150

CORE COURSE - SCHEME

Sl.No.	Semester	Course Code	NameoftheCourse	Credit	Hours/Week	ExamHours	Max.Marks		
							Int	Ext	Total
1	I	1B01ZLG	ProtistaandNonChordata-I	3	2	3	10	40	50
2	I	4B01ZLG-P	Practical I	*	2	-	-	-	
3	II	2B02ZLG	NonChordata-II	3	2	3	10	40	50
4	II	4B01ZLG-P	Practical-I	*	2	-	-	-	-
5	III	3BO3ZLG	Chordata-I	3	3	3	10	40	50
6	III	4B01ZLG-P	Practical-I	*	2	-	-	-	-
7	IV	4B04ZLG	Chordata-IIandcomparativeAnatomy	3	3	3	10	40	50
8	IV	4B01ZLG-P	Practical-I	4	2	3	15	60	75
9	V	5B05ZLG	Evolution, Ethology and Research Methodology	4	4	3	10	40	50
10	V	5B06ZLG	Animal Physiology	4	4	3	10	40	50
11	V	5B07ZLG	Biochemistry and Biophysics	4	4	3	10	40	50
12	V	5B08ZLG	Genetics	3	3	3	10	40	50
13	V	5D0_ ZLG	Generic Elective (Open) course	2	2	2	5	20	25
14	V	6B02ZLG - P	Practical II and Practical III	**	8	-	-	-	-
15	VI	6B09ZLG	Cell Biology, Immunology and Microbiology	4	4	3	10	40	50
16	VI	6B10ZLG	Molecular Biology and Bioinformatics	4	4	3	10	40	50
17	VI	6B11ZLG	Environmental Science	4	4	3	10	40	50
18	VI	6B12ZLG	Developmental Biology	3	3	3	10	40	50
19	VI	6B02ZLG - P	Core Practical II	4	8	4	15	60	75
20	VI	6B03ZLG - P	Core Practical III	4		4	15	60	75
			Field Study / Field Work				3	12	15
21	VI	6B13ZLG	Project	2	2	-	7	28	35

*** Examination at the end of IV Semester**

**** Examination at the end of VI Semester**

CREDITDISTRIBUTION(B.Sc.Zoology)

Semester	Common		Core	Complementary		GEC	Total
	English	Additional	Zoology	Botany	Chemistry		
I	4+3	4	3	2	2		20
II	4+3	4	3	2	2		20
III	4	4	3	2	2		17
IV	4	4	3+4	2+4	2+4		21
V			4+4+4+3			2	17
VI			4+4+4+3 +4+4+2				25
Total	22	16	56	12	12	2	120

Schemeofmarkdistribution(BSc.Zoology)

Courses		No.ofCourses	MarksperCourse	TotalMarks
Common	English	6	50	300
	Addl.language	4	50	200
Complementary	Botany	5 (4 theory + 1 practical)	40	200
	Chemistry	5 (4 theory + 1practical)	40	200
Core	Theory	12	50	600
	Practical + Field study	3	75 +75 + (75 + 15)	240
	Project	-	35	35
	GEC	1	25	25
Total				1800

GeneralRegulationsforB.ScZoology Programme

TheB.ScZoology (Core)programme isa120-credit programme spread over6semesterswithatotalmarkof1800.TheCoresubjecthas12Theorycourses,3Practicalcourses,GroupprojectandFieldstudycomponent.BesidestheCore,CommonandComplementary courses,thestudentshouldalsoobtain2creditsfroma Generic Elective Course whichshouldbefromotherdepartmentsandwithoutrepetitionofcourses.

Attendance

75%attendanceiscompulsoryfortheoryaswellaspracticalcourses,failingwhicha studentisnoteligibletoappearforuniversityexaminations.

Projectwork

Students arerequired toundertake a project work on problems pertainingto biological science in the VIth Semester. This project work can bedoneindividuallyorin groups(not morethan eightstudents). Scientificstudyon the topicselected is requiredto be carried out underthesupervision andguidanceof facultymembers. Each student has to activelyparticipatein theproject work. Theproblem/ topic chosen byanearlier batch of students fortheirproject work shallnot be repeated byalatterbatch. Acertificateto this effect has to beattached bythe Head of thedepartment. A well-documented project reportdulyattested bythe supervisingteacher and the Head of theDepartment must be submittedby*each* candidate at the end of the semester for evaluation. The report will be evaluated both internally and externally. Each student shall appear for aviva-vocebeforea team of twoexternal examiners.The questions will be based on the topic of study.It shallnot normallyexceed 10 minutes per candidate.

The project report must contain thefollowingsections.

1. Introduction and objectives of study
2. Literature review
3. Methodology
4. Observations
5. Interpretation / Discussion ofresults
6. References

Field study / Study tour

A field study/study tour of not less than 7 days is compulsory during the tenure of the programme. A minimum of 3 days should be kept apart for the study of animal diversity during the first four semesters. During the study tour students are expected to visit places of biological importance and research institutes. 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 tour specifying the places and institutions visited, date and time of visit, details of observations made etc. must be submitted by each student for external evaluation during the day of practical examination of VIth semester. The study tour report is compulsory for each student appearing for practical examination.

Records

A recordiscompulsoryforeachpracticalcourse. The student will notbe permitted to appear for practical examinations without certified practicalrecords. Therecordsareintendedasobservationrecordstobedoneinthe labitself.Artisticsketchesarenotexpected,exceptwherescientificdiagramsarerequiredasp erthesyllabi.Thevaluationof records, to be done internally and externally, shouldbebased on the effort andpromptnessofthestudentinlabwork.

Evaluation

The evaluation of each course shall contain two parts:

(i) Internal Assessment(ii) External Assessment

The internal to external assessment ratio is 1:4.

Theory courses

External Evaluation

The externaltheoryexamination of allsemesters shallbe conducted bytheUniversityat the end ofeach semester.

Scheme of Question Paper

Time : 3 HoursMax. Marks: 40

I.	Essay (Answer 2 out of 4) 2x8= 16 marks	
II.	Short essay (2 out of 3)	2x4=8 marks
III.	Short notes (6 out of 8)	6x2=12 marks
IV.	Objective Type (Multiple Choice) Questions Answer all questions	8 x 0.5 = 4 marks

Internal Assessment

Internal evaluation is to bedonebycontinuous assessment (Maximum : 10 Marks)

1. Testpapers(minimum2)6Marks
2. Assignment /Seminar/Viva 4Marks

Practical

Practical Paper I examination will be conducted at the end of fourth semester. Papers II and III exams will be at the end of sixth semester. There will be two external practical examiners and a skilled assistant (Internal) for practical examinations.

SchemeofPracticalExaminations

PracticalI

Time:3Hours Max.Marks:60

Majordissectionwithdisplay20marks

Minordissection/Mounting(withorwithoutsketch)10marks

Spotitems(6items)6x3 18 Marks

Record 12 Marks

PracticalII

Time:4Hours Max.Marks: 60

I. MajorQuestion12marks
II. Minor(1)6marks
III. Minor (2) 6 marks
IV. GeneticsProblem. 6marks
V. Spotitems(6items)6x3marks 18marks
VI. Record. 12marks

PracticalIII

Time:4Hours Max.Marks: 60

MajorExperiment15marks

MinorExperiment6marks

Minor Experiment 6 marks

StatisticsProblem6marks

Spotitems(5items)-5x3marks 15marks

Record 12 marks

Practical : Internal Evaluation(MaxMarks15)

Regularity/Punctuality - 2 marks

Laboratory Skill - 3 marks

Examination/ Viva - 5 marks

Record - 5Marks.

Evaluation of Field work Report

External Evaluation: 12 Marks

Internal : 3 Marks

Scheme of Project Evaluation

External Evaluation (28 marks)

Relevance of topic, Statement of objectives, Methodology, reference/Bibliography	:	8 marks
Presentation, Quality of analysis/Use of statistical tools, Findings and recommendations	:	8 marks
Viva – voce	:	12 marks

Internal Assessment (7 marks)

Punctuality /Regularity	1 mark
Participation in the work	2 Marks
Presentation of Report	2 Marks
Viva-voce	2 marks

1st Semester B.Sc. Degree Programme (Theory)

Zoology Core Course -1

PROTISTA AND NONCHORDATA - I

Code: 1B01ZLG

Credit: 3 Hours/ Week : 2 Total Hrs: 36

COURSE OUTCOMES

CO1. To understand the basic methods in zoology and animal classification.

CO2. Able to appreciate the process of evolution (unicellular cells to complex, multicellular organisms)

CO3. Familiar with the protist and non-chordate world (from Phylum Porifera to Mesozoa) that surrounds us.

CO4. Able to identify the invertebrates (from Phylum Porifera to Mesozoa) and classify them up to the class level with the basis of systematics

CO5. Understand the basis of life processes in the non-chordates (from Phylum Porifera to Mesozoa) and recognize the economically important invertebrate fauna.

1) INTRODUTION (5 hrs)

Life and its manifestations, Biology as a branch of science, Brief history of Biology, Definition of Zoology, Branches and scope of Zoology. The concept of Species.

Taxonomical Principles and tools - Systematics, Taxonomy, Phylogeny [Brief account], Approaches to taxonomy, Molecular taxonomy, Bar coding,International Code of Zoological Nomenclature (ICZN), Law of Priority. Brief account of different systems of classification: Linnaean system, Five Kingdom system, domain system, Cavelier-Smith systems. Ground plan concept.

2) Methods in Zoology (5 hrs)

Preparation of taxonomic key- simple dichotomous key, bracketed key, intended key; Multi access key, Computer aided Interactive Key. Preparation of zoological specimens- collection of aquatic organisms (plankton nets), soil organisms (Berlese Funnel), Insects (nets and traps); Preservation- wet preservation (formalin, alcohol), dry

preservation (micro slides, display boxes); sketching and labelling of biological specimens - labelling – general rules; Taxidermy – brief account.

3) The Protists (8 hrs)

General characters

Kingdom Chromista:- (Alveolate protozoans)

Phylum Ciliophora – Eg. *Paramecium* – morphology, nutrition and reproduction

Phylum Dinozoa – *Noctiluca* – morphology

Phylum Apicomplexa – Eg. *Plasmodium* – morphology and pathogenicity

Kingdom Protozoa

Phylum Amoebozoa – *Entamoeba* – morphology and lifecycle

Phylum Euglenozoa – *Trypanosoma, Leishmania* (morphology and pathogenecity)

(classification reference: Pechenik 2015 – Biology of the inverterbrates – 7thEdn)

4) KINGDOM ANIMALIA (18 hrs)

Basis for Animal kingdom classification [Levels of organization, Symmetry, Coelom]. Mention Radiata and Bilateria; Protostomes and deuterostomes, Ecdysozoa and Lophotrochozoa. Origin of invertebrates. **(2Hr)**

Subkingdom : PARAZOA

Phylum **PORIFERA** (**3** hrs)

Classification down to classes; salient features of the classes

Class CalcariaEg::*Leucosolenia*

Class DemospongiaeEg::*Spongilla*

Class HexactinellidaEg::*Euplectella*

Mention class Homoscleromorpha.

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

Phylum **PLACOZOA** – General characters

Phylum **CNIDARIA** [=COELENTERATA] **(5 hrs)**

Obelia- Morphology and life cycle

Classification down to classes; salient features of the classes

Class AnthozoaEg: *Adamsia*, *Zoanthus*, and *Madrepora*

Class Hydrozoa Eg: *Halistemma*, *Physalia*

Class ScyphozoaEg: *Rhizostoma* – mention lifecycle

Class CubozoaEg: *Carybdea*

General essay- 1. Polymorphism in Coelenterate 2. Corals and coral reefs

Phylum **CTENOPHORA** [=ACNIDARIA] **(1 hr)**

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

Phylum **PLATYHELMINTHES(3 hrs)**

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

Class TurbellariaEg: *Dugesia* – mention regeneration

Class CestodaEg: *Taeniasolium* – adaptations and pathogenecity

Class MonogeneaEg. *Polystoma*

Class TrematodaEg: *Schistosoma*, *Fasciola*- mention lifecycle and polyembryoni.

Phylum **NEMATODA** characters

Sexual dimorphism, lifecycle and pathogenicity of *Ascaris*

Examples: *Ancylostoma*, *Wuchereria***(2hrs)**

Phylum **GASTROTRICHA**Eg: *Chaetonotus*

Phylum **ROTIFERA–** mention parthenogenesis in BdelloidaeEg: *Brachionus* – mention lifecycle

Phylum **ACANTHOCEPHALA**Eg. *Acanthoceplalus*(**1**hr)

Phylum: MESOZOA

A brief account of dicyemid and orthonectidmesozoans with examples:

Dicyema, *Rhopalura* (**1** hr)

II Semester B.Sc. Degree Programme (Theory)

Zoology Core Course -2

NONCHORDATA - 2

Code: 2B02ZLG

Credit: 3 **Hours/Week : 2** **Total Hrs: 36**

COURSE OUTCOMES

CO1. Familiar with the non-chordate world (Coelomates - from Phylum Annelida to Hemichordata) that surrounds us.

CO2. Able to identify the invertebrates (Coelomates - from Phylum Annelida to Hemichordata) and classify them up to the class level with the basis of systematics

CO3. Understand the basis of life processes in the non-chordates (from Coelomates - from Phylum Annelida to Hemichordata) and recognize the economically important invertebrate fauna.

COELOMATA

Phylum ANNELIDA(5hrs)

General characters and classification down to classes; salient features of the following classes

Class Polychaeta. Example:*Nereis* – morphology and adaptations

Class Clitellata (Mention subclass Oligochaeta and Hirudinea) Example:*Megascolex* – Morphology and nervous system

Hirudinaria – Adaptations and economic importance

Brief account of vermiculture –Methods and significance

Phylum ONYCHOPHORA Eg. *Peripatus* (Mention its affinities) (1 Hr)

Phylum ARTHROPODA [15 hrs]

General characters

Penaeus – morphology, appendages, nervous system, reproduction and life cycle.

Mention prawn culture

Cockroach – Morphology, digestive system and nervous system.

Classification down to subphyla and classes; salient features of the following classes

Class Trilobita [brief account only]

Class Merostomata Example: *Limulus* – mention evolutionary significance and medical use

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

Class Myriapoda Examples: *Scolopendra, Spirostreptus*

Class Crustacea (= Superclass Crustacea) Example:*Sacculina*, *Eupagurus*

Class Insecta Examples: *Troidesminos*

Mouthparts of different insects – cockroach, honeybee, mosquito, butterfly

Economically important insects:

a) Agriculture pests -Type of damage and control of *Oryctes* and *Leptocoryza*;

b) Insects of medical importance – mention disease transmitted and control of mosquitoes and sandfly;

c) Beneficial insects – Honey bee – mention different species, brief account of apiculture, role as pollinators; *Bombyxmori* – brief account of sericulture and its significance.

Phylum MOLLUSCA [6 hrs]

General characters (discuss types and ultrastructure of shell, mantle and mantle cavity, radula, torsion and coiling)

Classification down to classes; salient features of the following classes

Class Polyplacophoraexample:*Chiton*

Class BivalviaExample:*Perna*

Class Scaphopoda Example:*Dentalium*

Class GastropodaExample:*Turbinella*

Class Cephalopoda Example: *Loligo*

Brief account of mussel culture and pearl culture

General essay- Economic importance of Molluscs

Phylum ECHINODERMATA [6 hrs]

Structural peculiarities of star fish; water vascular system in detail. Classification down to classes ; salient features of the following classes and very brief account of examples

Class CrinoideaExample:*Antedon*

Class AsteroideaExample:*Astropecten*

Class OphiuroideaExample:*Ophiothrix*

Class Echinoidea Example: sea urchin

Class Holothuroidea Example:*Holothuria*

General essay- Larval forms of *Echinoderms*

Phylum HEMICHORDATA [1 hr]

Salient features and Example: *Balanoglossus*

Coelomate Minor Phyla: (2 hrs)

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

Phylum PhoronidaExample:*Phoronis*

Phylum Ectoprocta [=Bryozoa] Example: *Bugula*

Phylum EchiuraExample:*Bonellia*

REFERENCES (For course 1 & 2)

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Bhaskaran, K. K. & Biju Kumar, A.: Economic Zoology. Manjusha Pubs, Calicut

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Ekambaranatha Ayyar, M. & Ananthakrishnan, T. N.: A Manual of Zoolog.y Vol. I [Part I & II], S. Viswanathan, Madras

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

III Semester B.Sc. Degree Programme

Zoology Core Course – 3

Chordata – I

Code: 3B03ZLG

Credit: 3; Hours: 3/Week; Total hours: 54

Course outcomes

CO1: Understand the origin and evolutionary relationship in different subphyla of chordates.

CO2: To understand the diversity of chordates (from urochordates to reptiles).

CO3: Understand the unique characters of urochordates, cephalochordates and vertebrates

CO4: Recognize life functions of chordates (from urochordates to reptiles).

Chordate characters [fundamental, general and advanced); chordates versus non-chordates; diversity of chordates; classification down to subphyla; salient features of each subphylum. (Young classification 1981 to be followed). Type study with special emphasis on comparing various functional systems (Comparative Anatomy) such as Morphology, Integumentary, digestive, respiratory, circulatory, excretory, nervous and reproductive systems, otherwise mentioned.

Unit 1. Introduction to Chordates. – Fundamental and shared chordate characters.

(**1 hr**)

Unit 2. Protochordata: Subphylum 1. **UROCHORDATA** [Tunicata] (**4 hrs**)

Affinities; add a note on neoteny [paedogenesis)

Classification down to classes

Class: Ascidiacea Type: ***Ascidia*** [morphology (adult & larvae) and retrogressive metamorphosis alone is required]

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)

Unit 3. Subphylum 3. **VERTEBRATA / Craniata** (**3 hrs**)

Superclass 1. AGNATHA- Characters

Class. Cephalaspidomorphi- Order: Cyclostomata.

Examples: *Myxine; Petromyzon* [mention Ammocoetes larva & its affinity to Cephalochordata]

Superclass 2. GNATHOSTOMATA - Characters

Unit 4. PISCES- Classification of Pisces down to orders; salient features of the following groups:

(**15 hrs**)

Class 1. Placodermi- Add a note ontheir systematic position.

Class 2: Chondrichthyes [cartilaginous fishes]

Type: Scoliodonsorrakowah (skeletal system excluded)

Sub class1. Elasmobranchii: Examples: Trygon, Pristis, Narcine

Sub class2. Holocephali: Example: Chimaera (rat fish)

Class 3: Ostechthyes [bony fishes]

Sub class1. Acanthodii

Sub class2. Actinopterigii

Sub class3. Sarcopterigii

Order Crossopterygii [lobe fins] Example: Latimeria

Order Dipnoi [lung fishes/] and their distribution. Examples: Neoceratodus, Protopterus, Lepidosiren.

Order Acanthopterygii [spiny-rayed fishes] Examples: Mugil, Rastrelliger, Sardinella, Tetradon, Heteropneustes, Hippocampus, Etroplus, Channa, Echeneis, Stromaeus.

General Essays: 1. Accessory respiration in fishes 2. Migration in fishes 3. Economic importance of fishes

Tetrapoda

Unit 5. Class Amphibia: (18hrs)

Type: *Euphlyctishexadactylus* (skeletal system included**)**

Classification down to order:

Order 1. Apoda: Examples: *Ichthyophis, Uraeotyphlus*

Order 2. Urodela: Examples: *Necturus, Ambystoma*, mention Axolotl and paedomorphosis

Order 3. Anura: Examples*: Bufo, Rhacophorus, Rana malabarica*.

Mention the discovery of Caecilians in Kerala eg: *Nasikabatrachussahyadrensis* and significance of 'Bush frogs' e.g., *Philautus* sp. (Direct development without larval stage).

General Essay: Parental care in Amphibia

Unit 6. Class Reptilia: (9 hrs)

Salient features of the following groups with examples.

Subclass Anapsida:

Order Cotylosauria*: [stem reptiles] Example: *Hylonomus*

Order Chelonia: [common turtles, tortoises etc.] Example: *Chelone*. Distinguish Turtles and

tortoises.

Subclass Lepidosauria:

Order Rhynchocephalia: Example: Sphenodon

Order Squamata:

Sub order: Lacertilia Examples: Chamaeleon, *Calotes*

Sub order: Ophidia Examples: Ptyas, *Typhlops*, *Naja*, *Daboia (=Vipera*) *Bungarus, Echis*, *Hydrophis*.

Subclass Archosauria

Order Crocodilia Examples: *Crocodylus, Gavialis,Alligator*

General topics. – 1. Biting mechanism of Snake and note on snake venom.

2. Identification key for poisonous snakes.

3. Extinct reptiles.

REFERENCE:

J.Z. Young (2004): The Life of Vertebrates

Jordan & Varma : Chordate Zoology, S. Chand Publications

Kotpal R.L : Modern Text Book of Zoolgy- Vertebrates

Kent GC and Cavr R.K (2000): Comparative Anatomy of the Vertebrates IX Edition, Mac GrawHill.

IV Semester B.Sc. Degree Programme

Zoology Core Course – 4

Chordata – II and Comparative Anatomy

Code: 4B04ZLG

Credits: 3 **Hours: 3/WeekTotal hours: 54**

Course Outcomes

CO1: Understand the general and unique characteristics and classification of Aves and Mammals

CO2: Understand the diversity and relation in form and structure of chordates.

Unit 1. Class AVES **(18 hrs)**

Type: Pigeon (excluding skull in skeletal system)

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

Subclass1. Archaeornithes

Order Archaeopterygiformes example: *Archaeopteryx* – brief account

Subclass2. Neornithes

Order1. Rheiformes example: *Rhea*

Order 2. Struthiorniformes example: *Struthio*[ostrich)

Order3. Casuariiformes example: *Casuarius*[cassowary)

Order4. Dinornithiformes [=Apterygiformes] example: *Apteryx* [kiwi)

Order 5. Sphenisciformes [Impennae] example :*Aptenodytes* [Penguin)

Order 6. Pelecaniformes[Pelicans, Cormorants] example *; Pelecanus*

Order 7. Ciconiiformes [Herons, Storks, ibis, Spoon bills] example: *Ardea, Phoenicopterus*

Order 8 Anseriformes [screamers, water fowls] example: *Anas*

Order 9. Falconiformes [diurnal birds of prey – falcons, hawks] example:*Mylvus*

Order 10. Galliformes [pheasants, quail, turkeys, grouse]example: *Pavocristatus*

Order11. Gruiformes [cranes, rails, coots, bustards] example: *Choriotis*

Order12. Charadriiformes [plovers, gulls, terns, auks, sand pipers] example:*Tringa*

Order13. Columbiformes [pigeons, doves, dodoes, sand grouse] example:*Columba*

Order14. Cuculiformes [cuckoos, roadrunners, turacos] example: *Eudynamys*

Order15. Psittaciformes [parrots, lories, cockatoos] example: *Psittaculakrameri*

Order16. Strigiformes [owls] example: *Bubo*

Order17. Apodiformes [swifts, humming birds] example: *Micropodus*

Order18. Coraciiformes [kingfishers & allies] example: *Alcedo*

Order19. Piciformes [wood peckers, barbets, honey guides] example:*Dinopium*

Order 20 Passeriformes [Perching birds] example *Passer domesticus*

Add a note on extinct birds: passenger pigeon [*Ectopistesmigratorius*), dodo

Rediscovery of Jerdon's courser [*Cursoriusbitorquatus*]

General topics –1) Flight adaptations in birds. 2) Migration in birds 3). Vocalization and its role in birds.

Unit 2: Class MAMMALIA (30 hrs)

Classification of Mammalia down to the orders cited with examples specified.

Type: **Rabbit** (*Orytolagus*) (15 hrs)

Subclass Prototheria: [egg-laying mammals] (2 hrs)

Order Monotremata Examples: *Ornithorhynchus* (platypus), *Tachyglossus* (= *Echidna*)

Subclass 2.Theria:

Infraclass1. Metatheria[Marsupials]

Order Marsupialia Examples: *Didelphis* (opossum), *Macropus* (kangaroo)

Infraclass 2. Eutheria: [true placental mammals]

Order 1. Insectivora. Examples: *Paraechinus* (hedgehog), *Suncus* (=Crocidura)

Order 2. Chiroptera. Examples: *Pteropus, Pipistrellus*

Order3. Dermoptera. Examples: *Cynocephalus* (=Galeopterus – flying lemur)

Order4. Edentata. Examples: *Bradypus*(sloth), *Dasypus* (armadillo)*Myrmecophaga* (spiny anteater)

Order 5. Pholidota. Example: *Manis* (pangolin / scaly ant eater)

Order 6. Primates Examples: *Loris*, *Macaca*, *Gorilla*, *Pongo*, *Hylobates*, *Homo*

Order 7. Rodentia. Examples: *Funambulus, Ratufa*

Order 8. Lagomorpha. (rabbits and hares)

Order 9. Cetacea. Examples: *Physeter* (sperm whale) *Delphinus* (dolphins), *Phocaena* (porpoise) *Balaenoptera* (baleen whale).

Order10. Sirenia Examples: *Trichechus* (manatee), Dugong.

Order 11. Carnivora. Examples: *Phoca* (seal), *Odobenus* (walrus), *Panthera*sps. *Viverricula*

Indica(civet)

Order 12. Perissodactyla Examples: *Equuscaballus* (horse), *Rhinoceros*

Order 13. Artiodactyla Examples: *Susscrofacristatus*, *Gaur*, *Giraffa*, *Hemitragus* (tahr), *Cervus*,*Axis axis* (spotted deer) *Antelope cervicapra* (antelope/ black buck)

Order 14. Proboscidea Examples: *Elephasmaximusindicus* [Indian elephant]

Loxodontaafricana [African savannah elephant] *Loxodontacyclotis* [African Forest elephant]

General essays. – 1. Dentition in mammals, 2. Aquatic mammals.

COMPARATIVE ANATOMY - Vertebrata (**6 hrs)**

1. Integumentary structures in vertebrates – scales, feathers and hairs; nails, claws, horns & antlers.
2. Heart and aortic arches in different groups of vertebrates (Shark, Frog, *Calotes*, Pigeon, Rabbit)
3. Evolution of kidney in different vertebrate groups(Pro, meso, meta and opisthonephros)
4. Jaw suspension in vertebrates {Amphistylic, Autodiastylic, Hyostylic, Autostylic (Monimostylic, Streptostylic, Holostylic, Craniostylic)}
5. Types of vertebrae – procoelus, amphicoelus, biconvex, amphiplatian, heterocoelus.

REFERENCE:

Kerala Bird Atlas (Online)

J.Z. Young (2004): The Life of Vertebrates

Jordan & Varma : Chordate Zoology, S. Chand Publications

Kotpal R.L : Modern Text Book of Zoolgy- Vertebrates

Kent GC and Cavr R.K (2000): Comparative Anatomy of the Vertebrates IX Edition, Mac GrawHill.

V Semester B.Sc. Degree Programme (Theory)

Zoology Core Course -5

EVOLUTION, ETHOLOGY AND RESEARCH METHODOLOGY

Code: 5B05ZLG

Credit: 4 4 Hrs/Week Total Hrs: 72

Course outcomes

CO1.Realise that the whole living system has a common ancestry and so all are related
CO2. Realise the fundamental characteristics of science as a human enterprise
CO3. Apply scientific methods in day to day life
CO4. Able to design a research work on a topic

SECTION A: EVOLUTION AND ETHOLOGY (36hrs)

1) Origin of life (4 Hrs)

Theories - Panspermia theory or Cosmozoic theory, Theory of spontaneous generation (Abiogenesis or Autogenesis), Special creation, Biogenesis, Endosymbiosis. Chemical evolution - Haldane and Oparin theory, Miller-Urey experiment;

2) Evidences of Organic Evolution (5hrs)

Morphological, anatomical, physiological, biochemical, Biogeographical, embryological and palaeontological evidences. Geological time scale, Fossils, Fossilization, fossil dating, significance of fossils

3) Theories of organic evolution (6 hrs)

Lamarck's theory and its criticism, Weisman's germplasm theory, Neolamarckism, Darwin's theory and its criticism, Contribution of Alfred Russel Wallace. Neo Darwinism, Hugo De Vries' mutation theory

4) Nature of evolution (5hrs)

Adaptive radiation and Divergent evolution (Darwin's finches), Convergent evolution,Preadaptation, species concept and intraspecific categories. Isolation and isolatingmechanisms. Speciation. Co evolution. kin selection . Mimicry and evolution - Batesian mimicry, Mullerian mimicry. Micro evolution and macro evolution

5) Modern concepts of evolutionary forces (5hrs)

Genetic basis of evolution, genetic drift, Hardy-Weinberg equilibrium, punctuated Equilibrium. Modern ideas on origin of life - naked gene hypothesis RNA world theory. Molecular evolution -Neutral theory of kimura, concept of molecular clock, mitochondrial eve hypothesis, molecular phylogeny, phylogeography, selfish genes, C value paradox.

6) Evolution of Man and vertebrates (5 hrs)

Organic evolution of human : different species of Primitive ape, apeman, primitive man, modern man. Socio cultural evolution, future evolution. Evolution of vertebrate groups - Fishes, amphibians, reptiles, birds and mammals (brief account)

7) Ethology (6 hrs)

Definition and History of ethology. Motivation models. Types ofbehaviours – innate and learnt. Types of learning with examples; patterns of behaviors – types of rhythms, navigation, homing instinct, hibernation, aestivation; pheromones- types and their effect on behavior, hormones and their action on behavior (aggressive and parental behavior) .Social life in insects (eg.honeybees - social organisation and communication) and mammals (eg.monkeys)

SECTION B: RESEARCH METHODOLOGY (36 hrs)

1). Introduction(5 Hours)

Definition of science as a type of knowledge and process – ancient science and origin of modern science. Principles and criteria of science – natural causality, universality, objectivity, falsifiability. Scientific attitude and scientific temper, pseudoscience, science *vs*. technology, Inductive and deductive approach.

2). Basic concepts of research(7 hrs)

Meaning, Objectives, Approaches, Types of research. Research Process (different steps of deductive research – identifying problem, review of literature, hypothesis, experiment, analysis of data, discussion, publication - with examples like Karl von Frisch's work on honey bee communication.

3). Experimentation and publication(4Hrs)

Principles of experimentation – replication, randomization and local control. Dependent and independent variables. Pilot study. Research report writing (Structure of a scientific paper). Presentation techniques: Oral presentation, Assignment, Seminar, Debate, Workshop, Colloquium, Conference. Peer review, plagiarism.

4) Analysis of data (biostatistics) (20 Hrs)

Biostatistics – definition, role of statistics in life sciences; Population and Sample; sampling - sample size, sampling errors and brief account of sampling methods;

Presentation of data: a) Graphic representation- histogram, frequency polygon, and frequency curve; b) Diagrammatic representation - line diagram, bar diagram and pie diagram.

Analysis of data (for grouped and ungrouped data): a) Measures of central tendency – mean, median and mode.b) Measures of dispersion – range, mean deviation and standard deviation.

Testing of Hypothesis – Simple, composite, null and alternative hypothesis; Types of errors - critical region, significance levels, power of test; Tests of significance – ANOVA, chi-square test and goodness of fit.

Correlation and regression (brief account). Data analysis packages – SPSS, R etc (brief mentioning only). Measurement of biodiversity-diversity indices (species richness, evenness and dominance)

Methodology

RoyKN:ATextBookofBiophysics;NewCentralBookAgency
AckermanE:BiophysicalScience;PrenticeHallInc.
PranabKumar Banerjee:IntroductiontoBiophysics;S.Chand.
Bailey,N.T. J.(1994/'95).StatisticalMethodsinBiology,3e,CUP/LPE.
Collins,H.andPinch,T.
(1993).TheGolem:WhatEveryoneShouldKnowAboutScience,CambridgeUniversityPress.
Gieryn,T.F. (1999).CulturalBoundariesofScience,Univ.ChicagoPress.
Gupta,S.P.(2002).StatisticalMethods.31e,SultanChand&Co.
Holmes,D.,Moody,P.andDine,D.(2006).ResearchMethodsfortheBiosciences,Oxford UniversityPress.
Pechenik,J. A.(1987).AShortGuideto
WritingAboutBiology,Boston.LittleBrown.Prasad,S.(2004/'05).ElementsofBiostatist ics,RastogiPubls.,Meerut.
Ruxton,G.D.andColegrave,N.(2006).ExperimentalDesignforLifeSciences,2e,Oxford UniversityPress.
Rastogi,V.FundamentalsofBiostatistics2ndedition–Ane'sstudentedition
ND.Sokal,R.R.andRohlf,F. I.IntroductiontoBiostatistics,W.H.Freeman.
Steel,R.G.D.andTorrie,J.H.PrinciplesandPracticeofStatisticswithspecialreferenceto BiologicalScience.
Verma,B.L.etal.(1993).Biostatistics,OBS,ND.

Evolution& Ethology

Andrews. M.I and Joy, K.P. 2003. Environmental biology, evolution, Ethologyand Zoogegraphy. St.Mary'spressandbookdept.Changanassery.
AubreyManning&Dawkins:AnIntroductiontoAnimalBehaviour;Cambridge.
Boulenger,E.G.Animalbehaviour,1994,AtlanticPub.& distributors
Darwin,C.: TheOriginofSpecies,6e.OUP.
DobzhanskyTh.(1964):GeneticsandtheOriginofSpecies.ColumbiaUniversityPress

V Semester B.Sc. Degree Programme (Theory)

Zoology Core Course -6

ANIMAL PHYSIOLOGY

Code: 5B06ZLG

Credit: 4 **4 Hrs/Week Total Hrs: 72**

COURSE OUTCOMES

CO1. Understand the function of various systems at cellular and system levels
CO2. Understand the mechanisms that work to keep the body alive and functioning
CO3. Apply the knowledge to lead a healthy life

Unit I: Tissues (3 Hrs)

Structure, location, classification and functions of epithelial tissue, connective tissue, musculartissue and nervous tissue

Unit II: Bone and Cartilage (3 Hrs)

2.1. Structure and types of bones and cartilages

2.2. Ossification

UNIT III: Neurotransmission Physiology (8 Hrs)

3.1. Membrane physiology

3.1.1. Functional consequences of molecular composition and arrangement (Gibbs Donnan

Equilibrium).

3.1.2. Transport across cell membrane- Diffusion, active transport, ionic pump(Na-K pump,

Calcium channel); uniports, symports and antiport, co-transport by symporters and anitporters.

3.2. Physiology of neuronal system

3.2.1. Excitable membranes

a) Membranes potential

b) Ions as current carriers - Protons, calcium, potassium, structure of cation-permeablechannels and chloride channels

3.2.2. Synaptic transmission

a) Electrical transmission

b) Chemical transmission

c) Mixed transmission

d) Neurotransmitters (eg. Acetylcholine, Adrenaline, GABA, Dopamine, Serotonin, Glycine)

3.2.3. Propagation of action potential across the myelinated and non-myelinated nerve fibres, All or none law, Summation.

UNIT IV: **Nutritional Physiology (8 Hrs)**

4.1. Constituents of normal diet and their daily requirements, balanced diet: A human perspective; Malnutrition(PEM, Obesity)

4.2. Digestion of carbohydrate, protein & lipids– role of salivary glands, liver, pancreas and

intestinal glands in digestion (Brief description of structure of glands expected).

4.3. Absorption of carbohydrates, lipids, amino acids, water, electrolytes, vitamins and minerals in GIT

4.4. Movements in GI tract (Brief description of histology is expected).

4.4.1. Bulk movement, peristalsis and defecation

4.4.2. The role of hormones (Gastrin, Enterogastrin, Cholecystokinin and Serotonin) and neurotransmitters (Acetylcholine and Adrenaline) in digestion and gastrointestinal motility

UNIT V: Physiology of Circulation (9 Hrs)

5.1. Structure of human heart

5.1.1. Pacemaker and specialized conducting fibers

5.2. Cardiac cycle

5.3. ECG – Principle and application

5.4. Neuro hormonal regulation of cardiac amplitude and frequency (Acetylcholine and Adrenaline)

5.5. Blood clotting mechanism (Extrinsic and Intrinsic Pathway), Anticoagulants.

5.6. Lymph channels of the body

5.6.1. Composition and formation of lymph

5.6.2. Functions of lymph and lymphatic system

UNIT VI: Physiology of Motility (8 Hrs)

6.1. Neuromuscular junction

6.2. Biochemistry of contractile proteins

6.3. Physiology of skeletal muscle

a) Actomyosin complex

b) Source of energy for muscle contraction - Cori Cycle

c) Sliding filament theory

d) Excitation- Contraction Coupling, Role of Calcium

e) Mechanism of relaxation

UNIT VII: Physiology of Respiration(9 Hrs)

7.1. Physiological anatomy and histology of respiratory passage and lungs

7.2. Mechanism of pulmonary ventilation (inspiration & expiration)

7.3. Alveolar ventilation, dead space and its effect on alveolar ventilation

7.4. Role of surfactant in alveolar expansion

7.5. Pulmonary volumes and capacities

7.6. Exchange of gases

7.7. Transport of gases

7.7.1.Transport of oxygen and carbon dioxide (Haldane Effect and Bohr Effect)

7.7.2. Oxygen dissociation curve

7.8. Neural and chemical regulation of respiration

7.9. Respiratory problems in high altitude and deep sea

UNIT VIII: Physiology of Excretion(8 Hrs)

8.1. Urine formation (glomerular filtration, tubular reabsorption and tubular secretion)

8.2. Mechanism of concentration of urine – Counter current system (counter current multiplier and counter current exchanger)

8.3. Ornithine Cycle

8.4. Hormonal control of urine formation

8.5. Renal regulation of acid base balance

8.6. Components (normal & abnormal) and characteristics of urine

8.7. Physiology of micturition

Unit IX: Endocrine System (6 Hrs)

Histology and function of thyroid, pancreas and adrenal. Function of pituitary

Classification of hormones; Mechanism of Hormone action; Signal transduction pathways forSteroidal and Non- steroidal hormones; Hypothalamus (neuroendocrine gland) - principal nuclei involved in neuroendocrine control of anterior pituitary; Placental hormones

Unit X: Reproductive System (5 Hrs)

Histology of mammalian testis and ovary; physiology of mammalian reproduction – menstrualand oestrous cycle

UNIT XI: Environmental Physiology (5 Hrs)

11.1. Concept of homeostasis, regulators and conformers.

11.2. Tolerance, resistance, acclimation and acclimatization.

11.3. Overview of thermal homeostasis in homeotherms, CNS regulation of body temperature maintenance.

11.4. Temperature compensation in poikilotherms

11.5. Overview of osmoregulation in aquatic and terrestrial animals (Osmoregulators and Osmoconformers)

REFERENCE BOOKS: ANIMAL PHYSIOLOGY

1. Guyton, A.C. (2015).Text Book of Medical Physiology, W.B. Saunders co.

2. Hoar, W.S.(1983). General and Comparative Physiology, Prentice Hall.

3. Prosser,C.L.(1978). Comparative Animal Physiology. W.B. Saundersco.

4. Schmidt Nielsen, K. (1994). Animal Physiology: Adaptation and Environment. Cambridge University Press

V Semester B.Sc. Degree Programme (Theory)

Zoology Core Course -7

BIOCHEMISTRY AND BIOPHYSICS

Code: 5B07ZLG

Credit: 4 **4 Hrs/Week Total Hrs: 72**

Course outcomes

CO1. Understand the importance of Bio molecules

CO2. Familiar with various biochemical pathways

CO3 : Develop knowledge about equipment like microscopes, spectrophotometers, centrifuges etc

SECTION A: BIOCHEMISTRY (42 Hours)

Unit -I:Water

Molecular structure & dipolar nature, dissociation– concept of pH, buffers- Handerson - Hassel Bach equation; **(02 hrs)**

Unit – II:Macromolecules:

Proteins

Basic structure, peptide bonds and biological importance of proteins and amino acids. Classification of amino acids based on functions – glucogenic and ketogenic aminoacids; essential, semi essential and non essentialaminoacods- structure of 20

proteogenicaminoacids. Structural levels of proteins – primary, secondary, tertiary and quaternary structure and the bonds present in them – alpha helical, beta pleated sheet (parallel & antiparallel). Molecular chaperones. Cell targeting of proteins. Ramachandran angles and Ramachandran plot. Classification of proteins based on water solubility-fibrous and globular proteins. Examples – keratin, silk fibroin, myoglobin, haemoglobin. Simple and conjugated proteins **(07hrs)**

Carbohydrates

Classification of carbohydrates. Biological functions of carbohydrates**(3 Hrs)**

Lipids

Basic structure and biological importance of lipids. Classification – Simple lipids, waxes, phospholipids (lecithin, cephalin), glycolipids (cerebrosides, gangliosides), steroids (cholesterol) and prostaglandins. **(04 hrs)**

Biologically important Nucleotides

Structure and importance of ATP, cyclic AMP, UTP, NAD, NADP, FMN, FAD. **(03hrs)**

Unit -III: Enzymes and Function:

Enzymes

Classification and Nomenclature (IUB) – 6 major classes. Concept of active sites, mechanism of enzyme action (lock and key & induced fit hypothesis); factors influencing the velocity of enzyme action- effect of pH, temperature, enzyme and substrate concentration; regulation of enzyme action- activation and inhibition (competitive, non competitive, allosteric and feed back); concept of free energy, kinetic theory, Michaelis-Menten equation; Km and Vmax values. Isozymes. **(10hrs)**

Unit – IV: **Vitamins**

biological importance-Fat soluble and Water soluble vitamins (vitamin B complex (Thiamine, Riboflavin, Niacin, Pantothenic acid, Cyanocobalamine, Folic acid, Pyridoxin) and C. Deficiency diseases **(04 hrs)**

Unit - V: Hormones

Classification based on chemical nature with structural details- Steroid Hormones e.g. Testosterone, Estrogen, Progesterone; catecholamine Hormones e.g. T3, T4, epinephrine, norepinephrine; Peptide Hormones e.g. Oxytocin and vasopressin; Protein Hormones e.g. Insulin and glucagon**(03hrs)**

Unit – VI: Metabolism:

Basal metabolism- calculation of BMR by Harris-Benedict formula; Energy metabolism- (a) Carbohydrate metabolism – glycolysis, glycogenolysis, glycogenesis, gluconeogenesis, Pentose Phosphate pathway, (b) Protein metabolism- deamination, transamination, decarboxylation, transmethylation. (c) Lipid metabolism – oxidation of glycerol and fatty acids; Biosynthesis of fatty acids; Kreb's cycle (structural details expected for all); Electron Transport System (ETS) and oxidative phosphorylation; chemiosmotic hypothesis **(16hrs)**

SECTION B: BIOPHYSICS (20 Hours)

Unit – 1: **Tools and Techniques:** (Principle, working methodology and applications)

(a) Microscopy – (a)Light microscope-resolving power of microscope (simple microscope, compound microscope, use of oil immersion objective), Phase contrast microscope, Fluorescent microscope, Electron microscope (TEM & SEM); Camera lucida and micrometry. **(7hrs)**

(b) Separation Techniques- Chromatography- paper, column and thin layer chromatography – principle and applications, mention HPLC;Cell fractionation Homogenization; Centrifugation – different types of centrifuge –principle and applications., differential and density gradient centrifugation, mention ultracentrifuge. Electrophoresis – paper and gel electrophoresis- polyacrylamide Gel Electrophoresis (PAGE) and Agorose Gel Electrophoresis. **(8 hrs)**

(c) Radioactive Techniques --(i) Autoradiography (ii) X-ray diffraction and crystallography.Applications of radioisotopes. Measurement of radioactivity (GM,scintillation counter, gamma counter) **(2 hrs)**

(d) pH meter- principle and applications **(1 hr)**

(e) Spectrophotometer-Principle; Beer-Lambert law, applications;

(i) Colorimeter (ii) Ultraviolet - visible spectrophotometer. Mention **NMR spectrophotometry(2 hrs)**

References-Biochemistry

1. Fundamentals of Biochemistry, J.L. Jain, S.Chand publications, 2004.

2. Lehninger's Principles of Biochemistry (2000) by Nelson, David l. and Cox, M.M. Macmillan / Worth, NY.

3. Harper's Biochemistry Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 24th edition, Prentice Hall International. Inc.

4. Principles of Biochemistry, Geoffrey L. Zubay, 3rd edition William W. Parson, Dennis E. Vance, W.C. Brown Publishers, 1995.

5. Principles of Biochemistry, David L. Nelson, Michael M.Cox, Lehninger, 4th edition, W.H. Freeman and company.

6. Biochemistry, Lubert Stryer, 4th edition, W.H. Freeman & Co, 1995.

7. Fundamentals of Biochemistry (1999) by Donald Voet, Judith G.Voet and Charlotte W Pratt, John Wiley & Sons, NY.

References-Biophysics

1.Gupta K.C, Bhamrah, H.S and G.S.Sandhu (2006) Research Techniques in Biological Sciences. Dominant Publishers and Distributors, New Delhi.

2. Kothari, C.R. and G.Garg. (2014) Research Methodology. Methods and Techniques. 3rd edn

3,Roy K N: A Text Book of Biophysics; New Central Book Agency

V SEMESTER BSc DEGREE PROGRAM (THEORY)

ZOOLOGY CORE COURSE 8

GENETICS

CODE: 5B08ZLG

Credit: 3; Hours: 3/week; Total Hours; 54

COURSE OUTCOMES

1. Comprehensive and detailed understanding of the chemical basis of heredity.
2. Understanding about the role of genetics in evolution.
3. The ability to evaluate conclusions that are based on genetic data.
4. The ability to understand results of genetic experimentation in animals.

Unit I. Introduction:

Brief account of Mendelian principles of inheritance. Short account of alleles (wild and mutant), homozygous and heterozygous condition of alleles. Mono, di and trihybrid crosses, back cross and test cross. (1 hr)

Unit II. Interaction of genes.

Allelic and non-allelic interactions.

a) Supplementary factors (modifying genes) 9:3:3:1 – eg. comb pattern in chickens
b) Epistasis
c) Dominant epistasis (12:3:1) – coat colour in dogs
d) Recessive epistasis (9:3:4) – coat colour in mice
e) Duplicate recessive genes or complementary genes (9:7) -flower colour in sweet pea
f) Dominant and recessive interaction (13:3) – plumage colour in fowls
g) Lethal genes – coat colour in mice

h) Polygenic inheritance – Human skin colour

(6 hrs)

Unit III. **Multiple allelism**.

Inheritance of coat colour in rabbits. Genetics of A B O blood groups and Rh factor in man. Mention other groups such as M, N, MN and Bombay group.Erythroblastosisfoetalis.

(6 hrs)

Unit IV. Linkage and Crossing Over.

Chromosomal theory of inheritance. Linkage groups. Complete and incomplete linkage.Disruption of linkage through crossing over and recombination. Factors affecting crossing over. Significance of crossing over. Construction of linkage maps(5 hrs)

Unit V. **Sex Determination**.

Autosomes and sex chromosomes. Male heterogamy and femaleheterogamy. Role of Y chromosome in humans, mention SRY gene. Sex determination in drosophila. Genic balance theory of Bridges. Barr bodies, Lyon's hypothesis; evidences for X chromosome inactivation. Gynandromorphism and sex mosaics. Hormonal and environmental influence on sex determination.

(7 hrs)

Unit VI. **Mutation.**

Mutation theory of De Vries; types of mutations; molecular basis of gene mutations. Mutagens, natural and induced mutations. Significance of mutations.Chromosomal aberrations – structural and numerical. (6 hrs)

Unit VII. Extrachromosomal inheritance.

General characteristics

Extranuclear inheritance by cellular organelles -*Chlamydomonas*

Maternal inheritance– Shell coiling in *Limnaea*

Extra-Nuclear Inheritance by Endosymbionts - Kappa particles in *Paramecium*

(3 hrs)

Unit VIII. Human genetics

Eugenics, euphenics and euthenics. Pharmacogenetics

(2 hrs)

Unit IX. Human Chromosomes:

Identification of Human Chromosomes: - Characterisation ofChromosomes using various banding techniques such as Q banding, G banding, R banding, C banding and NOR banding. Chromosome band nomenclature, designation of bands and sub bands.Karyotyping.

(2hrs)

Unit X. **Congenital Disorders**:

Chromosomal and molecular level causes and clinical featuresof:

A) Autosomal abnormalities – 1) Trisomy 21 2) Trisomy 18 3) Trisomy 13 4) Cri-du-chat syndrome

B) Sex chromosomal abnormalities – 1) Turner's Syndrome 2) Klinefelter's Syndrome 3) XYYmales.

C) Autosomal Dominant diseases and traits – Achondroplasia, Huntington's Disease, Myotonic Muscular Dystrophy, Neurofibromatosis, polydactyli.

D) Autosomal Recessive diseases – Alkaptonuria, PKU, Albinism, Cystic Fibrosis, Sickle Cell Anaemia, Thalassemia,

E) Sex-linked Diseases – Colour blindness, Haemophilia, LeschNyhan Syndrome.

F) Holandric traits.

G) Multi factorial Traits- Congenital heart diseases- ASD, VSD, Diabetes, Alzheimer'sdisease.

(12 hrs)

Unit XI. **Genetic Services**

Pedigree Construction – symbols used in pedigree construction. Genetic Counselling – Directive and Non-directive. Counselling for dominant, recessive, X linked and multifactorial diseases.

(4hrs)

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VI SEMESTER BSc DEGREE PROGRAM (THEORY)

ZOOLOGY CORE COURSE 9

CELL BIOLOGY, IMMUNOLOGY AND MICROBIOLOGY

CODE: 6B09ZLG

Credit: 4; Hours: 4/week; Total Hours; 72

Course outcomes

CO1. Structural and functional aspects of basic unit of life i.e. cell concepts
CO2. Gather basic concepts of Cell Biology along with various cellular functions
CO3. Understand the basic concepts of immunity
CO3. Understand the diversity of microbes and their use and harm

SECTION A .CELL BIOLOGY (42 hours)

Unit I : Introduction and Definition of cell biology:

History and scope of cell biology, cell theory and its modern concept, prions, viroids, virions, virus and Mycoplasma. Prokaryotes and eukaryotes.(2Hrs)

Unit II :**Histological techniques**

Preparation of whole mounts. Fixation and its aims, fixatives (formalin, ethanol, Bouin's fluid, Carnoy's fluid, Osmium tetroxide). Dehydration, embedding and sectioning (brief account).Staining: common histological stains-haematoxylin, eosin, carmine. Vital stains – neutral red,Janusgreen, methylene blue, rhodamine. Stains for electron microscopy – uranylaceate, lead acetate. (3 hrs)

Unit III Cell structure and functions

1) Protoplasm – Physical properties and functions (1hr)

2) Plasma membrane – Structure (Fluid Mosaic model),

Functions of plasma membrane, passive transport, active transport, bulk transport. Differentiation of cell surface — invaginations, microvilli, basement membrane, tight junctions (zonula occludens), gap junctions (nexus) ; cell coat (4 hrs)

3) Endoplasmic reticulum: structure and functions (1 hr)

4) Ribosomes: Prokaryotic and eukaryotic ribosomes, ultrastructure and chemical composition &functions of ribosomes. Monosomes and polysomes. Biogenesis of ribosomes. (2 hrs)

5) Golgi bodies: structure and functions (cellular secretion in detail) (2 hrs)

6) Lysosomes: structure and chemical make-up polymorphism, function (cellular digestion in detail), GERL concept. (2 hrs)

7) Mitochondria: structure and chemical composition – Bioenergetics including respiratory chain and electron transport (Brief account only – details of steps not expected) Biogenesis(2 hrs)

8) Cytoskeleton – brief account of microtubules, microfilaments and intermediate filaments. (1 hr)

9) Microbodies; Peroxisomes and Glyoxysomes (1 hr)

10) Interphase nucleus: nuclear envelope, pore complex, Nucleus, Nucleoplasm, chromatin – structure and functions. (2 hrs)

11) Chromosomes: Physical and chemical structure, chromatin – heterochromatin and euchromatin. (2 hrs)

12) Giant Chromosomes – structure and functions of Polytene and Lampbrush chromosomes –mention puffs and bands, Endomitosis. (3 hrs)

13) Introduction to cell signaling, Signal Transduction, receptors involved in signal transduction, Principles of Membrane Transport – Carriers and Channels, Endoytosis – phagocytosis and pinocytosis, receptor mediated endocytosis, Transcytosis(2hr)

Unit IV Cell Division

Cell cycle – Gl, S, G2 and M phases , check points of cell cycle , use of Colchicines .Meiosis –details of synaptonemal complex, crossing over, chiasma, terminalisation (5hrs)

Unit VI Cancer

Benign and malignant tumours - metastasis. Characteristics of cancer cells. Celllines-HeLa cells, L-cells. Hypothesis about cancer- mutation, viral and defective immunity. Protooncogenes, oncogenes (cellular and viral), anti oncogenes. Chromosomal abnormalities associated with malignancies like chronic myleocytic leukemia and retinoblastoma. (5 hrs)

Unit VII Cells of extracellular matrix.

Connective tissue cells – mesenchyme cells, fibroblasts,mastcells, fat cells; blood cells-erythrocytes, lymphocytes, monocytes, neutrophils, eosinophils, plasma cells, and macrophages.Stem cells – scope and significance. (2 hrs)

SECTION B – IMMUNOLOGY (14 hours)

Unit I. Basic concepts.

Immunity, Infection, Natural and Acquired immunity, Active and Passive immunity, Immune response - Cell Mediated and Humoral. (3 hrs)

Unit II. Antigens, Haptens and Antibodies.

Typical structure of antibody; Classes of antibodies and their functions. Genetic basis of antibody diversity (somatic recombination theory) Major HistocompatibilityComplex, HLA typing. Antigen-antibody reactions – precipitation, agglutination, complement fixation, opsonisation. Primary and secondary immune responses. (7hrs)

Unit III. Hypersensitivity reactions.

Types of hypersensitivity-I, II, III & IV. Brief accounts of allergy and anaphylaxis, autoimmune reactions, immune complex disease (e.g., rheumatic fever), allograft rejection. (2 hrs)

Unit IV Immunological techniques – Immunodiffusion ,Immunoelectrophoresis, ELISA, RIA

(2 hrs)

SECTION B – MICROBIOLOGY (16 hours)

1. **Introduction to microorganisms**1 hr

2. **Structure and classification of viruses**

Classification based host, vital morphology and nucleic acid characteristics. Structure and architecture of virus (TMV, lambda phage) 2 hrs

3. Bacteria

Classification of Bacteria based on morphology, gram's staining and culture characteristics. Bergey'smanual .Growth of bacterial culture – physical and chemical requirements for growth ,Bacterial cell culture media and methods, phases of bacterial growth. Structural organization of bacteria**:** Ultra structure of bacterial cell wall, cell membrane – flagella – pili – capsule and genome

(4 hrs)

4 Classification of Fungi (Brief account only). (1 hr)

5. Sterilization techniques

Physical, Chemical,Physico-chemical (2 hrs)

6.Microbes in human welfare

House hold products, industrial products (alcohol, antibiotics, acids, enzymes ,bioactive molecules eg.cyclosporine, statin, streptokinase, sewage treatment(primary and secondary treatment, mention BOD),biogas production ,biocontrol agents and bio fertilizers. (3 hrs)

7.Microbes and human diseases

Bacterial diseases(Tuberculosis, Pneumonia, typhoid and Leprosy, Viral diseases (AIDS, Chicken pox, Poliomyletis, H1N1, SARS and Nipah) disease caused by prions, Fungal diseases eg Ring worm (3hrs.)

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2. KoshyThomas&JoePrasad Mathew(Editors)(2011)*CellBiologyand MolecularBiology*.

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VI SEMESTER B. Sc. DEGREE PROGRAMME (Theory) ZOOLOGY

Core Course- 10

Code: 6B 10 ZLG

MOLECULAR BIOLOGY & BIOINFORMATICS

Credit: 4; Hours: 4/ week; Total Hours: 72hrs.

Course outcomes:

CO1. Understand the importance of Bio molecules
CO2.Familiar with various tools and applications of Bioinformatics

Section A Molecular Biology (45 Hours)

Unit I. Introduction

DNA as the genetic material. Griffith's experiment-Bacterial transformations- Experiments by Hershey and Chase. Central dogma of molecular biology and central dogma reverse; retroviruses. Classical concepts of genes. One gene – one enzyme hypothesis, one gene – one polypeptide hypothesis; Modern concept of genes – cistron, muton, recon, complicon, transcripton, split genes, overlapping genes, pseudogenes, jumping genes, cryptic genes, Housekeeping genes. [brief accounts only].

(5hrs)

Unit II. Organization of genome

Nucleosome structure and packaging of DNA into higher order structures, Brief idea about condensins and cohesins. Mitochondrial genome. Role of mitochondrial genes in phylogeny.

(3hrs)

Unit III. Nucleic Acids

Watson and Crick model of DNA structure. Different forms of DNA (A, B, Z) RNA Structure, types & Function. (3 hrs)

Unit IV. DNA replication

Messelson& Stahl experiment, Semiconservative method of DNA replication. Brief account of enzymes involved in DNA replication. (3hrs)

Unit V DNA Repair

Types of DNA repair mechanisms - Photo reactivation, nucleotide and base excision repair, SOS repair, RecBCD model in prokaryotes, Concepts of Eukaryotic Repair mechanisms. (5hrs)

Unit VI Transcription

Mechanism of Transcription in prokaryotes and eukaryotes, Transcription factors, Post Transcriptional Modifications and Processing of Eukaryotic RNA - Capping, Poly A tailing and splicing in mRNA; Split genes: concept of introns and exons, splicing mechanism, alternative splicing and RNA editing. (5 hrs)

Unit VII: Translation

Genetic code, Characteristics of genetic code- Wobble Hypothesis. Mechanism of protein synthesis in prokaryotes & Eukaryotes. (5 hrs)

Unit VIII: Gene Regulation

Lytic cycle and lysogeny of phages, Regulation of transcription in prokaryotes: Lac operon. Regulation of transcription in eukaryotes: Activators, enhancers, silencers, repressors, gene

modulation, siRNA and RNAi, miRNA mediated gene silencing. Epigenetic Regulation: DNA Methylation, Histone Methylation & Acetylation. (6 hrs)

Unit IX: Molecular Techniques

PCR, Western and Southern blot, Northern Blot. Model organisms for studying Molecular Biology (*Neurospora, Caenorhabditis and Drosophila*), CRISPR/CAS9gene editing. (5hrs)

Unit X. Genetic engineering

Introduction, rDNA technology, Gene cloning, cloning vectors (plasmids, phages, cosmids, BAC, YAC), Enzymes of rDNA technology (Exonuclease, Endonuclease, Restriction enzyme, DNA ligase, DNA polymerase, Reverse transcriptase). (5hrs)

Section B BioInformatics (27 hrs)

Unit I. An overview of Bioinformatics, scope (2hr)

Unit II. Major databases in Bioinformatics

a) Primary databases:

Nucleotide sequence databases – Mention EMBL, DDBJ, Genbank

Protein sequence databases – Mention Swiss Prot, PIR, MIPS

Metabolite databases – Mention KEGG, EcoCye

b)Secondary databases: Mention PROSITE, PRINTS, Blocks.

c) Database Search Engines (5 hrs)

Unit III. Sequence Similarity Search

Pairwise sequence alignment, Local and Global, Mention Needle- Wunsch and Smith-Waterman, BLAST, FASTA. Multiple sequence alignment: Mention CLUSTAL

(6 hrs)

Unit IV. Micro arrays and its application (4 hrs)

Unit V. Genomics-Comparative, Functional; Medical applications. DNAsequencing-Sanger and Gilbert Method, Next Generation Sequencing (2hrs)

Unit VI. Proteomics Tools and applications –SDS page, isoelectric focusing, 2D PAGE, Mass spectrometry (Brief account) (3 hrs)

Unit VII. Metabolomics Tools and applications (Brief account) (2hrs)

Unit VIII. Applications of Bioinformatics – Drug designing (CADD), Personalised medicines, Molecular Phylogenetics

(3hrs)

Topics for Assignments and Seminars

1. DNA as the genetic material. Griffith's experiments**.**
2. Experiments by Hershey and Chase.
3. one gene – one enzyme hypothesis, one gene – one polypeptide hypothesis;
4. Central dogma of molecular biology and central dogma reverse.
5. Internet as a knowledge repository.
6. Digital libraries. National services such as INFLIBNET**.**
7. Blot test - Southern, Northern and Western
8. Watson and Crick model of DNA structure
9. Types of RNA
10. Genetic code, featurescontributionsof Nirenberg and associates, Khorana.
11. Classical and Modern genes concepts.

References:-Molecular biology

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Anilkumar et al. General informatics and bioinformatics.AneBooksPvt Ltd.

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Rajaraman V – Introduction to Information Technology; Prentice Hall.

Web Resources: https://www.ncbi.nih.gov, https://www.ddbj.nig.ac.jp, https://www.uniprot.org, *https://www.ebi.ac.uk*

VI SEMESTER B. Sc. DEGREE PROGRAMME (Theory) ZOOLOGY

Core Course- 11

Code: 6B 11 ZLG

ENVIRONMENTAL SCIENCE

Credit: 4; Hours: 4/ week; Total Hours: 72hrs.

CO1. Able to describe the relation between abiotic and biotic factors.

CO2. Students are able to describe various biological interactions.

CO3. Students are able to understand how change in population affect the ecosystem

Unit I. Environment and ecosystem.

Abiotic factors – Electromagnetic spectrum, visible light, temperature, soil, water, air. Biotic factors- Producers, consumers, decomposers. Ecosystem interaction and interrelationship between biotic and abiotic factors. **5 Hrs**

Unit II. Ecosystem Energetics

Fundamental concepts relating to energy. Energy flow in the ecosystem. Laws of thermo dynamics. Energy based classification of ecosystem; concept of productivity; food chain; food web, trophic levels and trophic structure. Ecological pyramids. **5 Hrs**

Unit III. Biogeochemical cycles.

Basic types – Gaseous cycle- Carbon & Nitrogen cycles. Sedimentary cycle – Phosphorous cycle. Recycling pathways and recycling index. **5 Hrs**

Unit IV. Limiting factors

Concept of limiting factors Leibig's law of minimum, Shelford's law of tolerance, combined concept of limiting factors. **2 Hrs**

Unit V. Population Ecology

Properties of Population – Density, Natality, mortality, age distribution, biotic potential, environmental resistance, energy carrying capacity. Population growth forms (J and S curves). Emigration, immigration, migration and population fluctuation. **4 Hrs**

Unit VI. Community Ecology

Definition and characters. Community Structure, stratification, Ecotone and Edge effect, Ecological indicators. Community periodicity. Ecological succession- Basic types of succession. Process in succession. **3 Hrs**

Unit VII. Population interactions

Interspecific association – positive and negative interactions – mutualism, commensalisms, parasitism, predation, competition, proto cooperation. (with two examples for each) **4 Hrs**

Unit VIII. Habitat ecology

Biosphere and its divisions – Lithosphere, Hydrosphere and Atmosphere. Physical features, fauna and their adaptations in A) Aquatic ecosystem – i) Freshwater (lentic & lotic) ii) Marine – Pelagic and benthic realms. iii) Estuaries iv) mangroves. B) Terrestrial ecology – Forest, Grassland, desert, tundra and cave biomes. Brief account on laterite hills of Kerala **8 Hrs**

Unit IX. MAGNITUDE, LEVEL AND GRADIENT OF BIODIVERSITY

Introduction, Definition of biodiversity, scope, hotspots of biodiversity, Levels of biodiversity: Species diversity – brief account on economic values-food, medicine, clothing, shelter, tools and recreation; scientific and educational values; spiritual and ecological values).Ecosystem diversity – definition; values of ecosystems Genetic diversity - importance of genetic diversity, mention basic methods for molecular analysis of genetic diversity - electrophoresis, RFLP, RAPD,, hotspots of biodiversity, **6 Hrs**

Unit X. VALUES AND THREATS TO BIODIVERSITY

Introduction, Value of biodiversity- Direct use Value, Indirect use value, Aesthetic value, Ethical Value, Optional Value. Threats to Biodiversity- causes leading to loss of biodiversity, Man-wildlife conflict. **3 Hrs.**

Unit XI. CONSERVATION OF BIODIVERSITY

Conservation of biodiversity. Threatened and endemic species. Species Extinction, Characters of species susceptible to extinction, IUCN Red list Categories. In-situ Conservation-Protected Areas, National Parks, Wildlife Sanctuaries, Biosphere Reserves, Preservation Plots, Project Tiger, Project Elephant, Sacred Forests and Sacred Lakes. Ex-situ Conservation-Botanical Gardens, Zoos, Aquaria. Mention role of NBPGR, NBAGR in Biodiversity Conservation **4 Hrs**

Unit XII. GOVERNANCE IN CONSERVING BIODIVERSITY

Introduction- International efforts for biodiversity Conservation, Biodiversity Treaty, Role of Environmental Institution in Biodiversity Conservation-NBA, SBB. Brief account on PBR, BMC and ABS, Legal regulations-Biological Diversity Act, 2002. Environment (Protection) Act – 1986. Wildlife Protection Act (1972), The Forest (Conservation) Act – 1980. **4 Hrs**

Unit XIII. DISASTER AND ENVIRONMENTAL MANAGEMENT

Introduction- Disaster prone regions in India. Flood, Earth quakes, Cyclones and their mitigation Measures. Government efforts towards Disaster Management. EIA, EIS, Role of Remote Sensing in Environmental Monitoring **4 Hrs**

Unit XIV. GLOBAL ENVIRONMENTAL ISSUES

Causes, effects and remedial measures of Air, water, Noise, Radioactive, solid waste and pesticide pollution. Ozone depletion, Greenhouse effect, Global warming, Acid rain, oil spills, Impact of sand miming, wetland reclamation, rain water harvesting. Brief Account on National green tribunal Act 2010

8 Hrs

Unit XV. ANIMAL DISTRIBUTION AND ZOOGEOGRAPHICAL REALMS

Animal distribution –cosmopolitan, discontinuous, bipolar and isolated distribution. Zoogeographical Realms-Palaearctic, Nearctic, Neotropical, Ethiopian, Oriental and Australian realms (Brief account with physical features and fauna). Wallace line, Weber's line. Insular fauna. Oceanic islands and continental islands. Brief account of the biogeography of India – Western Ghats and Himalayas. **7 Hrs.**

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7. Odum E P and Barret : Fundamentals of Ecology; Thomson.
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VI SEMESTER BSc DEGREE PROGRAM (THEORY)

ZOOLOGY CORE COURSE 12

CODE:6B 12 ZLG

DEVELOPMENTAL BIOLOGY

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

CO 1 : Understandthemajorstepsinembryologicaldevelopment.

CO 2: Understandtheintricatemechanismsinvolvedinthedevelopmentofanimals.

Unit I.Introduction (1hr)

Theories of preformation, epigenesis, germplasm & recapitulation

Unit II.Types of eggs (2 hr)

(a) Structure of a typical egg (frog)

(b) Classification of egg based on: the amount of yolk (micro, meso&macrolecithal), the distribution (iso, centro&telolecithal), presence or absence of shell (cleidoic& non cleidoic), the development (determinate & indeterminate) with examples. (Diagrams expected)

(c) Egg membranes (primary, secondary and tertiary).

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

(a)Cell differentiation, totipotency, pluripotency, dedifferentiaton and redifferentiation

(b) Controlled gene expression during development, Homeotic genes, Mention Hoxgenes,

(c) Stem cells, their significance and applications

Unit IV. Cleavage and cell lineage (3 hrs)

(a)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).

(b) Different types of blastula (Coelobastula, Stereoblastula, Discoblastula& Blastocyst).

(c) Cell lineage studies in planocera.

Unit V. Morphogenetic movements &germlayers (2hrs)

(a)Epiboly (Invagination, involution, convergence, divergence, infiltration, delamination & ingression) &Emboly

(b) Germlayers& its fate.

Unit VI. Development of Amphioxus (3hrs)

(a)Structure of gametes

(b) Fertilization, Cleavage, Blastulation, Gastrulation &Neurulation

Unit VI. Development of Frog (5 hrs)

(a)Fertilization, Cleavage, Blastulation, Gastrulation.

(b)Tubulation(Notogenesis, Neurulation& coelom formation)

(c) Organogenesis of brain, eye and heart.

Unit VII.Development of chick (6 hrs)

(a) Structure of egg

(b) Fertilization, cleavage, blastulation& gastrulation

(c) Salient features of chick embryo at 18, 24 & 33, 48 hour stage. (Torsion and flexion).

Unit VIII.Development of Man (5 hrs)

(a)Gametogenesis: Structure of sperm, Spermatogenesis, Structure of Graffian follicle & Oogenesis

(b) Capacitation, insemination, acrosomal reaction, ovulation, activation of ovum, fertilization membrane & polyspermy.

(c) Cleavage, Blastulation, Implantation, Gastrulation

(d) Gestational changes (trimesters), Parturition & Lactation

Unit IX Metamorphosis (4hrs)

(a)Types of metamorphosis (Holometabolous&Hemimetabolous)

(b) Hormonal control of metamorphosis in insects

(c) Changes during amphibian metamorphosis

(d) Hormonal control of metamorphosis in amphibians-example frog;Mentionneoteny with example.

Unit X Extraembryonic membranes & placenta (4hrs)

(a) Development of extraembryonic membranes in chick.

(b) Extraembryonic membranes in man & its functions.

(c) Types of placenta in man (Based on origin, Nature of contact, distribution of villi, Histological intimacy) & its role.(diagrams expected)

Unit XI Reproductive technologies (5hr)

(a)Brief account of semen collection, preservation, storage, artificial insemination, infertility management.

(b)Cryopreservation and embryo transfer-Collection and care of eggs, in vitro fertilization and embryo transfer, test tube babies

(c) Assisted Reproductive Techniques (ART) IUF, ET, AI, GIFT, ZIFT, ICSI embryo or oocyte donation,surrogate mother.

Unit XII.Regeneration (2 hrs)

(a)Definition & types (Morphollaxis and epimorphosis)

(b) Histological and Cytological events in regeneration in general, mention factors affecting regeneration

Unit XIII Parthenogenesis(2hrs)

(a)Types of parthenogenesis

(b)Factors influencing & significance.

XIV.Experimental Embryology (4 hrs)

(a)Fate map (example frog)

(b) Methods of fate map Construction — Vital staining, Marking With carbon particles &radio active tracing

(c) Spemann's constriction experiments on amphibian embryos (Potency of nuclei and grey crescent)

(d) Gradient experiments in sea urchin,

(e) Organizers in amphibian development (primary, secondary &tertiary).

Unit XV.Teratology (2hrs)

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

Seminar Topics / Assignment (Only for Internal assessment)

1. Structure of different types of egg (amphioxus, frog, insect)
2. Corpus haemorhagicum, Corpus luteum & Corpus albicans
3. Types of regeneration
4. Factors affecting regeneration
5. Role of hormones in parturition and lactation.
6. History of embryology

References

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Wolpert, L.: Principles of Development, 1994, OUP.

Muller, Developmental Biology, Springer Publishers.

B.Sc. ZOOLOGY DEGREE PROGRAMME (PRACTICALS)

PRACTICAL- I

(PROTISTA , NON CHORDATA AND CHORDATA)

Code:4B 01 ZLG(P)

Lecture hours :2 hours/week in the first four Semesters Credits : 4.

In TAXONOMY specimens should be identified by their generic name. Students should examinethe specimens in the lab and draw labelled sketches. Notes should contain classification,morphological and functional peculiarities and other significant features. The record should be inthe form of an observation book. Artistic diagrams are not needed. There should be no tracing offigures from textbooks. Only the relevant region need be drawn in some case. (e.g., head & tailregion of snakes). Wherever possible, specimens not included in the theory syllabus should begiven for lab study, so that students are introduced to more organisms. In SECTIONS andOSTEOLOGY, neatly labelled scientific diagrams should be drawn.

TAXONOMY: Protista (2) Porifera (2) Cnidaria (4) Platyhelminthes (2) Nematoda (2) Annelida (3) Onychophora (1) Arthropoda (8) Mollusca (5) Echinodermata (3) Hemichordata (1)Protochordata (2) Agnatha (1) Chonrichthyes (2) Osteicthyes(3) Amphibia (4) Reptilia (5) Aves (2) Mammalia (2)

SECTIONS: (5 items) Hydra T.S, Planaria T. S, Ascaris T.S, Earthworm T.S, Nereis Paraapodia, Branchiostoma T S.

Identification and study of insect pests (Any 4)

Study of beneficial insects (Any 2)

Identification of fish (up to sub-class and species characters): *Cirrhinus mrigala, Labeo rohita, Labeo calbasu, Catla catla, Channa striatus, Mystus vittatus, Pampus argenteus, Harpadon nehereus.* (Any 4)

Identification of different types of bird feathers (quill,countor,filoplumes and down)

OSTEOLOGY:

Shark – vertebra

Frog – typical, 7th, 8th, 9th vertebrae and urostyle.

Rabbit vertebrae – atlas, axis.Pectoral girdle – bird,

Bird – Cervical Vertebra, synsacrum, sternum.

Mammal-Pelvic girdle – rabbit.

MOUNTINGS:

Earthworm – setae (a few loose setae), Prawn- appendages, Honey bee – Mouth parts,Honey bee- pollen basket, Cockroach-mouth parts, Cockroach- salivary apparatus. Lepidoptera - wing Scales, Fish Scales (Cycloid, Placoid)

Plant bug – mouthparts, Shark – placoid scales

DISSECTIONS:

Earthworm – nervous system (Minor)

Cockroach – nervous system (Major)

Cockroach – Digestive system (Minor)

Female reproductive System. (Minor)

Prawn – nervous system (Major)

(Labelled sketches of mountings and dissections to be drawn in the record)

V SEMESTER B. Sc. ZOOLOGY DEGREE PROGRAMME (PRACTICALS)

Practical II

Code: 6B02 ZLG(P)

Lecture Hours 8/week in the 5th semester with 4 credit and Examination in the 6th semester

Cytology, Immunology and Microbiology

1. Micrometry -Measurement of microscopic objects. (Minor)
2. Study of mitotic stages – Onion root tip squash preparation. (Major)
3. Study of meiosis – Grasshopper testis squash. (Demo)
4. Salivary gland Chromosome- Drosophila (Demo)
5. Staining of buccal epithelial cells. (Minor)
6. Staining of Bacteria (Minor)
7. Staining of blood film to study blood cells. (Major)
8. Determination of blood groups. (Minor)
9. Bacterial Staining. (Minor)
10. Staining of Yeast Mitochondria (Minor)

Environmental Science

1. Estimation of dissolved oxygen using Winkler's method. (Major)
2. Estimation of dissolved carbon dioxide in water. (Major)
3. Qualitative analysis of fresh water / marine plankton. (Minor)
4. Analysis of soil fauna. (Minor)
5. Measurement of salinity
6. Measurement of water PH using PH paper.
7. Turbidity using Secchi disc
8. Estimation of hardness of three different water samples.
9. Construction of food web
10. Study of ecological adaptations – any three
11. Study of Mutualism (Hermit crab and sea anemone), commensalism (Echeneis and shark), Parasitism (Sacculina on crab), Predation (Snake and Rat)
12. Study of zoogeographical realms anddistribution of animals using map

Genetics.

1. Simple problems based on

Monohybrid cross, Dihybrid cross, Test cross, Incomplete dominance, Multiple alleles, Sex linked inheritance

2. Study of genetic disorders.

a.Down's syndrome

b.turner's syndrome

c,Klinefelter's syndrome

d Edwards syndrome

e.Patau syndrome

f.Neurofibromatosis.

Study of Polytene chromosomes and lamp brush chromosomes using photographs

Buccal smear – Identification of Barr Body

Study of monohybrid cross using coloured beads.

Construction of Pedigree chart.

Study of Drosophila and Human Karyotype

Developmental Biology

Study of slides/models/specimens with neat labelled sketches and notes

1. Frog – blastula C S, gastrula V S, neurula V S. (any two)

2. Chick embryo – Primitive streak, 24 hrs, 33 hrs and 48 hrs.

3.Axolotl larva

4. Mammalian foetus with placenta.

5.T.S of testis and ovary

Evolution

1.Problems using Hardy Weinberg equilibrium

2.Identification of organism and their evolutionary significance.

Limulus, Peripatus, Hemichordata

VI SEMESTER B.Sc. ZOOLOGY DEGREE PROGRAMME (PRACTICALS)

Lecture Hours 8/week and Credit:4

PRACTICAL III

CODE: 6B03 ZLG(P)

BIOCHEMISTRY, BIOPHYSICS, PHYSIOLOGY, BIOSTATISTICS, BIOINFORMATICS.

I.BIOCHEMISTRY

1. Qualitative Analysis.

A) Reactions of carbohydrates:

(i) General test for carbohydrates- Molisch's test.

(ii) Tests for monosaccharides – Benedict's test, Fehling's test, Moore's test, Rapid furfural test, Seliwanoff's test, Barfoed's test– (Any 3 tests).

(iii) Test for non-reducing disaccharides – Hydrolysis test.

(iv) Test for polysaccharide – Lugol's iodine test.

B) Tests for proteins–Ninhydrin test, Biuret test, Nitric acid test, Millon's test, Sodium nitroprusside test – (Any 3 tests).

C) Tests for lipids – Solubility test, Spot test, Acrolein test, Emulsification test, Saponification

test, Sudan test – (Any 3 tests).

(Testing of 3 unknown samples to be a major experiment for practical exam)

2. Estimation of protein – Biuret method/ Estimation of glucose- orthotoludene method (Major)

3. Measurement of pH using pH meter. (Minor)

4. Colorimetry –

a) Determination of absorption maxima. (Minor)

b) Preparation of standard curve and estimation of solute concentration in a sample. (Major)

5. Chromatography – Determination of Rf value and identification of amino acid (Demo)

6. Microtomy – Preparation of serial sections (Demo)

II. BIOSTATISTICS

1. Simple problems in statistics – mean, median, mode, mean deviation & standard deviation for grouped and ungrouped data.

2. Construction of simple and percentage Bar diagram, Pie diagram & Histogram.

3. Use of computers for diagramatic and graphic representation of data- bar diagram (3 types), pie diagram and frequency curve.

III. BIOINFORMATICS

1. DNA and Protein pair wise sequence alignment by FASTA & BLAST (Minor)
2. Visualization of protein structure from PDB by CLUSTAL X & CLUSTAL W. (Minor)

V. PHYSIOLOGY

1. Measurement of blood pressure using sphygmomanometer(Minor)
2. WBC differential count (Major)
3. Urine analysis for abnormal constituents (glucose, albumin)(Minor)
4. Measurement of human pulse rate. (Minor)
5. Estimation by haemoglobinometer (sahli's haemoglobinometer) (Minor)
6. Total RBC count using Haemocytometer(Major)
7. Study of permanent slide of transverse section of organs: Lung, Stomach, liver, kidney, intestine
8. Isolation of casein from milk (Minor)

MODEL QUESTION PAPERS

B.Sc. ZOOLOGY

CORE COURSES

First Semester B.Sc. Degree Programme (Theory)

Core Course in Zoology

1BO1 ZLG : PROTISTA AND NONCHORDATA - I

Time : 3 Hours **Maximum Marks : 40**

(Give illustrations and figures wherever necessary)

I. Essay questions (Each question carries 8 marks) Answer any 2.

1. Select any six phyla you have studied and prepare different types of taxonomic keys.

2. Explain polymorphism in coelenterates

3. Differentiate *the* different canal systems in sponges

4. Classify phylum Platyhelminthes down to classes with important features and examples

II. Short Essay (Each question carries 4 marks) Answer any 2.

5. Differentiate between metazoa and mesozoa.

6. Explain the different types of coral reefs.

7. Explain how the classification concepts evolved from Linnaeus to Cavelier Smith,

III. Short answer questions (Each question carries 2 marks) Answer any 6.

8. Describe polymorphism in Physalia

9. With the help of suitable diagram explain the structure of Cnidoblast

10. Give an account on coelom and its formation.

11. Differentiate Ecdysozoa and Lophotrochozoa

12. What is metagenesis? Give an example

13. Differentiate polyp and medusa

14. What is taxidermy?

15. Distinguish between acoelomata and psuedocoelomata

IV. Multiple Choice Questions (Each question carries 0.5 marks) Answer all.

16. Which of the following has no segmentation?

a) Hydra b) Earthworm c) Centipede d) Cockroach

17. Carybdea is a

a) Porifera b) Protozoan c) Coelenterate d) Nematode

18. The taxonomic unit of any rank/category is known as

a) Species b) Taxon c) Taxis d) Genus

19. The rules for the naming of living organisms were first established by

a) John Ray 2) Charles Darwin 3) Carolus Linnaeus 4) Robert Gunther

20. In flat worms, annelids, mollusca and arthropods the mouth develops from blastopore, such animals are called ……..

a) Protostomes b) Deuterostomes c) Cyclostomes d) Blastostomes

21. Polyembryoni is found in

a) Ascaris b) Leishmania c) Fasciola d) Leucosolinia

22. Trypanosoma belongs to Phylum ...

a) Euglenozoa b) Amoebozoa c)Ciliophora d) Apicomplexa

23. Cidippid is the larval stage of

a) Gastrotricha b) Rotifera c) Ctenophora d) Acanthocephala

SECOND SEMESTER B.SC. DEGREE PROGRAMME (THEORY)

CORE COURSE IN ZOOLOGY

2BO2 ZLG : NONCHORDATA - II

Time : 3 Hours **Maximum Marks : 40**

(Give illustrations and figures wherever necessary)

I. Essay questions (Each question carries 8 marks) Answer any 2.

1. Describe the appendages of prawn
2. Explain morphology and adaptations of Nereis
3. Explain water vascular system of Asterias
4. Describe the economic importance of Mollusca

II. Short Essay (Each question carries 4 marks) Answer any 2.

5. Compare the mouthparts of butterfly and mosquito
6. Explain the types and ultrastructure of molluscan shell
7. Explain the digestive system of cockroach

III. Short answer questions (Each question carries 2 marks) Answer any 6.

8. What are Trilobites? Mention their evolutionary significance.

9. Describe the special features of Class Ophiuroidea.

10. How the male and female differ in Bonellia?

11. Why Hemichordata is included in Non chordata?

12. What is evisceration?

13. How significant is the role of honey bee as pollinator?

14. What is the medical importance of sandfly

15. What are the adaptations of *Hirudinaria*?

IV. Multiple Choice Questions (Each question carries 0.5 marks) Answer all.

16. Which is the largest butterfly in Kerala?

a) *Troides minos* b) *Papilio budha* c) *Papilio polymnester* d) *Graphium teredon*

17. Internal shell is present in

a) Pila b) Sepia c) Chiton d) Lamellidens

18. Shipworm is

a) Annelid b) Echinoderm c) Mollusc d) Arthropod

19. The larva present only in members of gastropods

a) Trochophore b) Glochidium c) Muller's larva d) Velliger

20. Devil fish is the common name of

a) Sepia b) Octopus c) Loligo d) Teredo

21. Aristotles lantern is found in

a) Sea urchin b) Brittle star c) Star fish d) Holothuria

22. Which of the following species build the largest nest

a) *Apis dorsata* b) *Apis mellifera* c) *Apis indica* d) *Trigona*

23. Auricularia is the larval stage of

a) Echinoidea b) Asteroidea c) Ophiuroidea d) Holothuroidea

III SEMESTER B.SC. ZOOLOGY DEGREE PROGRAMME (THEORY)

CORE COURSE IN ZOOLOGY

3B03 ZLG CHORDATA –I

Time : 3 hrs Marks : 40

(Give illustrations and figures wherever necessary)

I. **Essay Questions (Each Question carries 8 marks) Answer any TWO**

1. Write an essay on accessory respiration in fishes
2. Describe the respiratory system in *Euphlyctis hexadactylus*
3. Write an essay on the structure of heart and arterial system in shark
4. Write an essay on the classification of Class Reptilia upto orders with examples

II. **Short Essay (Each Question carries 4 marks) Answer any TWO**

5. Explain retrogressive metamorphosis with an example
6. Write a note on Cephalochordata
7. Sketch and label the integumentary system in frog

III **Short Answer Questions (Each Question carries 2 marks) Answer any SIX**

8. Write a note on snake venom
9. Explain the aquatic adaptations of fishes
10. Describe the structure of poison apparatus of snake.
11. Comment on *Sphenodon*
12. Write a note on Holocephali
13. Briefly explain the advanced features in Order Crocodilia
14. What are the arboreal adaptations in *Chamaeleon*
15. Write the salient features of Apoda. cite an example

V **Multiple choice Questions (Each Question carries 0.5 marks) Answer all**

16. Which of the following is a lung fish

a)Trygon b)Mugil c)Protopterus d)Channa

17. ..... is a Caecilian

a)Ichthyophis b)Ambystoma, c)Rhacophorus d)Philautus

18. Venom of ..... is neurotoxic

a)Ptyas b)Viper c)Bungarus, d)Coral snakes

19. Calotes belongs to the Order

a)Chelonia, b)Lacertilia, c)Rhynchocephalia, d)Ophidia

20. ..... shows catadromus migration

a)Salmon b)*Anguilla c)Lamprey d)Sturgeon*

21. Dermal scales are seen in

a)Draco b)Calotes c)Uraeotyphlus d)Sphenodon

22. Tetralocular heart is present in

a)Gavialis b)*Echis c)Hylonomus d)Chelone*

23. .....is a cartilaginous fish

a)Lepidosiren b)*Narcine c)Etroplus* d)*Hippocampus*

FOURTH SEMESTER B.Sc. ZOOLOGY DEGREE PROGRAMME (THEORY)

CORE COURSE IN ZOOLOGY

4B 04 ZLG CHORDATA II AND COMPARATIVE ANATOMY

Time : 3 hrs **Marks 40**

(Give illustrations and figures wherever necessary)

I. **Essay Questions (Each Question carries 8 marks) Answer any TWO**

1. Write an essay on the dentition in mammals
2. Describe the digestive system in *Oryctolagus*
3. Write an essay on the flight adaptation in birds
4. Write an essay on the evolution of kidney in different vertebrate groups

II. **Short Essay (Each Question carries 4 marks) Answer any TWO**

5. Explain adaptations in aquatic mammals
6. Write a note on Subclass Prototheria
7. Differentiate between Archaeornithes and Neornithes. Site examples

III Short answer Questions (Each Question carries 2 marks) Answer any SIX

8. Write note on different type of vertebrae

9. Sketch and label the typical vertebra inn Rabbit
10. Briefly Describe the air sacs in birds
11. Comment on *Macropus*

12.Write a note on Order Chiroptera

13. Write a brief note on *Cursorius bitorquatus*

14.What are the salient features of Order Sphenisciformes

15.Write a note on Autodiastylic jaw suspension

V **Multiple choice Questions (Each Question carries 0.5 marks) Answer all**

16.*Tringa*is belongs to the Order

a.Columbiformes b.Charadriiformes c. Falconiformes, d.Cuculiformes

17..... is a toothless organism

a.Bradypus b. Pongo c. Odobenus d. Odobenus

18. Which organism is known as the toothless whale?

a.*Balaenoptera b.Physeter c.Delphinus d.Phocaena*

19. Which one is a flightless bird?

a.*Ardea b.Ardea c. Choriotis d.Eudynamys*

20..... is a Perching bird.

a.*Mylvus b. Passer domesticus c.Dinopium d.Psittacula krameri*

21 Which of the following is an egg laying mammal

a.*Tachyglossus b.Didelphis* c.*Cynocephalus d. Dasypus*

22. Example for Order Perissodactyla is

a.*Rhinoceros, b.Giraff c.Axis axis d.Antelope cervicapra*

23.Frog's kidney is

a. Pronephros b.Mesonephros c.Metanephro d. Opisthonephros)

5th Semester B.Sc. Degree Programme (Theory)

Zoology Core Course -5

EVOLUTION, ETHOLOGY AND RESEARCH METHODOLOGY

Code : 5B 05 ZLG

Time : 3 Hours **Maximum Marks : 40**

(Give illustrations and figures wherever necessary)

SECTION A: EVOLUTION AND ETHOLOGY

I.Essay questions (Each question carries 8 marks) Answer any 1.

1. Describe the social organisation and communication in honey bees

2.Explain the concepts of molecular evolution

II. Short Essay (Each question carries 4 marks) Answer any 1.

3. Explain natural selection with examples

4. Discuss Oparin theory and Miller-Urey experiment

III. Short answer questions (Each question carries 2 marks) Answer any 3.

5. What is geological time scale?

6. Differentiate Batesian mimicry and Mullerian mimicry

7. Comment on future evolution of human being

8. What is mitochondrial eve hypothesis?

IV. Multiple Choice Questions (Each question carries 0.5 marks) Answer all.

9. Use and disuse theory was proposed by

a) *Aristotle* b) *Lamarck* c) *Darwin* d) *Dawkins*

10. Sympatric speciation develops reproductive isolation without

a) geographical barrier b) barrier to mating c) genetic change d) barrier to geneflow

11. A species inhabiting different geographical areas is known as

a) sympatric b) allopatric c) sibling d) biospecies

12. learning not to respond is

a) habituation b) conditioning c) motivation d) insight learning

SECTION B: RESEARCH METHODOLOGY

I.Essay questions (Each question carries 8 marks) Answer any 1.

13. What are the different methods of graphic and diagrammatic representation of data

14. Explain the key steps in scientific method

II. Short Essay (Each question carries 4 marks) Answer any 1.

15. Explain the principles of experimentation

16. What are the measures of dispersion?

III. Short answer questions (Each question carries 2 marks) Answer any 3.

17. What is biodiversity index?

18. What is pilot study

19. What is pseudoscience?

20. What is null hypothesis?

IV. Multiple Choice Questions (Each question carries 0.5 marks) Answer all.

21. The total number of species is

a) species richness b) species evenness) Species dominance d) species diversity

22. which statistical test helps to compare ratios

a) t test b) ANOVA c) chi square test d) z test

23. Karl Popper is well known for the concept of

a) pseudoscience b) falsification c) randomisation d) inductive research

24. Which of the following is not a measure of central tendency?

a) mean b) median c) mode e) range

FIFTH SEMESTER B.Sc. ZOOLOGY DEGREE PROGRAMME (THEORY)

CORE COURSE IN ZOOLOGY

5B06 ZLG ANIMAL PHYSIOLOGY

Time : 3 Hours **Maximum Marks : 40**

(Give illustrations and figures wherever necessary)

I. Essay questions (Each question carries 8 marks) Answer any TWO.

1. Describe the ultra structure of skeletal muscle fibre and explain the biochemical changes associated with muscle contraction.

2. Give an account of exchange of gases in human body.

3. Explain how a nerve impulse is conducted along a nerve fibre.

4. Write an essay on major endocrine glands in man and their hormones.

II. Short Essay (Each question carries 4 marks) Answer any TWO.

5. What is oxygen-haemoglobin dissociation curve ?

6. Explain the structure of haemoglobin.

7. Role of hormones in the follicular phase of female sexual cycle.

III. Short answer questions (Each question carries 2 marks) Answer any SIX.

8. What is hypoxia ?

9. What are the functions of Oxytocin?

10. What are Neurotrophins?

11. What is vital capacity ?

12. What is muscle twitch ?

13. What is coronary thrombosis ?

14. What is Corpus albicans?

15. What is renal hypertension ?

IV. Multiple Choice Questions (Each question carries 0.5 marks) Answer all.

16. Corpus luteum secretes

a)Progesterone

b)Testosterone

c)Luteinizing hormone

d)Lactogenic hormone

17. Tendons function to connect together

a)Bones

b)Muscles

c)Muscle to bones

d)Bones to skin

18. Hamburger's phenomenon is also known as

a)Bicarbonate shift

b)Chloride shift

c)Sodium shift

d)None of these

19. The tectorial membrane is found in

a)Eye of frog

b)Ear of mammals

c)Eye of mammals

d)Nasal canal in man

20. Which of the following is not a component of dietary fibre?

a) Cellulose

b) Pectin

c) Lignin

d) Agar

21. The risk of obesity and heart disease is increased by a diet high in

a) Fat

b) Saturated fat

c) Cholesterol

d) all of the above

22. Respiratory centre is located in

a) Hypothalamus

b) Cerebellum

c) Cerebrum

d) Medulla oblongata

23. Mountain sickness is due to

a) Low PO_2

b) Low CO_2

c) High PO_2

d) High CO_2

FIFTH SEMESTER B.Sc. ZOOLOGY DEGREE PROGRAMME (THEORY)

CORE COURSE IN ZOOLOGY

5B07 ZLG: BIOCHEMISTRY AND BIOPHYSICS

Time: 3 hours **Maximum marks: 40**

(Give illustrations and figures wherever necessary)

I. Essay Questions (Each Question carries 8 marks) Answer any TWO

1. Describe Kreb's cycle .Add a note on the energetics of Kreb's cycle.
2. Explain the principle, working and applications of SEM.
3. Write an essay on the mechanism of enzyme action. Write down any two factors influencing the velocity of enzyme action.
4. Write an essay on the principle and working of a centrifuge. Add a note on the different types of centrifuge.

II Short Essay Questions (Each Question carries 4 marks) Answer any TWO

5. Write a short essay on the principle and working of paper chromatography.
6. Briefly explain the classification of hormones based on the chemical nature.
7. Explain the concept of pH and buffers. Write down Handerson Hassel Bach equation.

III Short Answer Questions (Each Question carries 2 marks) Answer any SIX

8. Write down the structure of cyclic AMP.
9. Explain in brief Ramachandran map.
10. Explain the resolution of a microscope.
11. Distinguish between glycogenesis and gluconeogenesis.
12. What is autoradiography?
13. Explain the concept of free energy.
14. What is transamiation?. Give an example.
15. What are vital stains? Give two examples.

IV Multiple choice Questions (Each Question carries 0.5 marks) Answer all

16. --------- is a pancreatic hormone.

(a)Adrenalin (b)Glucagon (c)Estrogen (d)Thyroxine

17. --------- is a fat soluble vitamin.

(a)Ascorbic acid (b)Retinol (c)Cyanocobalamin (d)Thiamine

18. --------- is a separation technique.

(a)Centrifugation (b)Microtomy (c)Electrophoresis (d)Chromatography

19. Cloverleaf model is exhibited by

(a)mRNA (b)rRNA (c)tRNA (d)DNA.

20. The working principle of ---------- is Beer Lambert's law.

(a) Spectrophotometer (b)HPLC (c)Autoradiography (d)X-ray crystallography

21. ---------- is a steroid hormone.

(a) Insulin (b)Epinephrine (c)Progesterone (d)Oxytocin

22. Stain used in electron microscopy.

(a)Methylene blue (b)Safranin (c)Janus green (d)Uranyl acetate

23. Which of the following is an aromatic aminoacid.

(a) Tryptophan (b)Alanine (c)Isoleucine (d)Methionine

FIFTH SEMESTER B.Sc. ZOOLOGY DEGREE PROGRAMME (THEORY)

CORE COURSE IN ZOOLOGY

5B08 ZLG GENETICS

Time : 3 hrs **Marks 40**

(Give illustrations and figures wherever necessary)

I Essay Questions (Each Question carries 8 marks) Answer any TWO

1. Explain hormonal and environmental influence on sex determination
2. What are multiple alleles? Explain on the basis of coat colour in rabbits
3. Explain any four autosomal dominant diseases of man
4. Give an account of chromosomal aberrations

II Short Essay Questions (Each Question carries 4 marks) Answer any TWO

5. Explain molecular basis of gene mutation
6. What is polygenetic inheritance
7. Explain sex linked disease

III **Short Answer Questions (Each Question carries 2 marks) Answer any SIX**

8. Eugenics

9. Lethal genes

10. Alzheimer's disease

11. MN blood group

12. G banding

13. Gynandromorphism

14. Genetic counselling

15. Recombination

V. **Multiple choice Questions (Each Question carries 0.5 marks) Answer all**

16. Turner's syndrome in human caused by

(a)autosomal aneuploidy (b) sex chromosome aneuploidy (c)Polyploidy(d) Point mutation

17. Study of improvement of human race by providing ideal nurture is called

(a) Eugenics (b) Euphenics (c) Euthenics (d)None of the above

18. Erythroblastosis foetalis is found in the children having

(a) Both father and mother Rh positive(b)Rh positive father and Rh negative mother(c) Both father and mother Rh negative(d)Rh negative father and Rh positive mother

19. Number of Barr body in normal human male is

(a)0 (b)1(c)2 (d)3

20. The amino acid change in sickle cell anaemia is

(a) Gtutamic Acid to valine(b) valine to glutamic acid(c)valine to tryptophan(d)glutamic acid to lysine

21. Which one is a test cross

(a)TtxTt (b) TTxTt (c) TTxTT(d) Ttxtt

22. Sex index ratio of super female of Drosophila is

(a)1.5 (b)1.0 (c)0.5 (d)0.3

23.If a haemophilic man marries a woman carrier for haemophilia, what would be the possibility of their daughter would be haemophilic

(a)100% (b) 75% (c)50% (d)0%

SIXTH SEMESTER B. SC. ZOOLOGY EXAMINATION

CORE COURSE IN ZOOLOGY

6B09 ZLG : CELL BIOLOGY, IMMUNOLOGY AND MICROBIOLOGY

Time 3Hrs **Max. Marks 40**

I. Essay Questions (Each Question carries 8 marks) Answer any TWO

1. Explain fluid mosaic model of plasma membrane
2. Describe the structure of mitochondria and explain electron transport chain
3. Explain the structure of antibody, describe its polymorphism
4. Explain classification of bacteria

II. **Short Essay Questions (Each Question carries 4 marks) Answer any TWO**

5. Describe various characteristics of cancer cells
6. Explain cell cycle and describe various cell cycle checkpoints
7. explain cell mediated and humoral immunity

III. Short Answer Questions (Each Question carries 2 marks) Answer any SIX

8. What is lamp brush chromosome
9. What is chiasmata
10. Give four important functions of endoplasmic reticulam
11. What is vital staining give two examples
12. What are haptens
13. What is opsonisation
14. Explain gram staining
15. Write the symptoms of Tuberculosis

IV Multiple choice questions (Each Question carries 0.5 marks) Answer all

16. Which is a stain used in electron microscopy

    (haematoxylin, neutral red, rhodamine, lead acetate)

17. Site of protein synthesis

    (Golgi bodies, Nucleus, Nucleolus, Ribosome)

18. The stage of cell cycle involving DNA replication

    (S, G1, G2, None of this)

19. Final electron acceptor of electron transport chain

    (NADH, FADH2, CytC, O2)

20. Antibody present in colostrum

    (ImG, ImA, ImM, ImE)

21. Which among the following is not a bacterial disease

    (Tuberculosis, Chicken pox, Leprosy, Diphtheria)

22. An example for passive immunity

    (Snake antivenin, tetanus toxoid, polio vaccination, None of the above)

23. Cyclosporins are obtained from

    (*Trichoderma polysporem, Tolypocladium inflatum, Cylindrocarpon lucidum,* All of them)

SIXTH SEMESTER B. Sc. ZOOLOGY EXAMINATION

CORE COURSE IN ZOOLOGY

6B 10 ZLG MOLECULAR BIOLOGY & BIOINFORMATICS

Time 3Hrs **Max. Marks 40**

I. Essay Questions (Each Question carries 8 marks) Answer any TWO

1. Explain Watson and crick model of DNA?
2. Briefly, explain various DNA repair mechanisms?
3. Describe different DNA data bases?
4. Explain the process of DNA replication?

II. Short essay Questions (Each Question carries 4 marks) Answer any TWO

5. What is operon, explain how lac operon functions?
6. What is Bioinformatics, explain the scope in Biology?
7. What are the characteristics of genetic code?

III. Short answer questions (Each Question carries 2 marks) Answer any SIX

8. What are cryptic genes?
9. Explain wobble hypothesis?
10. Write a note on BLAST?
11. What is proteomics?

12. What are the necessary features for a good cloning vecter?

13. What is PCR, explain how it helps gene amplification?

14. How Cas9 helps gene editing?

15. Which are the different Enzymes used as tools in rDNA technology?

IV. Multiple choice Questions (Each Question carries 0.5 marks) Answer all

16. The inducer in Lac operon

    (Galactose, Arabinose, Lactose, Lactic acid)

17. The left turning DNA

    (B DNA, A DNA, C DNA, Z DNA)

18. The histone associated with linker DNA

    (H3, H2A, H1, H4)

19. Most abundant RNA in the cell

    (tRNA, mRNA, rRNA, SnRNA)

20. A metabolomics database is

    (KEGG, PIR, EMBL, DDBJ)

21. Nitrogen base not present in DNA

    (Guanine, Adenine, Thymine, Uracil)

22. Enzyme known as molecular scissors

    (Ligase, Endonuclease, Exonuclease, Helicase)

23. Opal codon is

    (UAG, UGA, UAA, AUG)

SIXTH SEMESTER B. SC. DEGREE EXAMINATION

CORE COURSE IN ZOOLOGY

6B 11 ZLG : ENVIRONMENTAL SCIENCE

Time: 3 hours **Total Marks: 40**

I. Essay Questions (Each Question carries 8 marks) Answer any TWO

1. Write an essay on ecological succession.

2. Write an account on interspecific association with examples.

3. Define biodiversity. Explain the different levels of diversity.

4. Briefly explain sedimentary cycle with examples.

II. Short essay Questions (Each Question carries 4 marks) Answer any TWO

5. Briefly discuss laws of limiting factors

6. Explain Population growth forms with examples

7. Write a brief account on laterite hills of Kerala

III. Short answer Questions (Each Question carries 2 marks) Answer any SIX

8. What are the remedial measures for water pollution?

9. National green tribunal Act 2010

10. Disaster Management

11. What are ecological pyramids?

12. Comment on the importance of mangroves in the ecosystem

13. Isolated distribution?

14. What are the Role of Remote Sensing in Environmental Monitoring

15. Describe the features of Tundra biome

IV. Multiple choice Questions (Each Question carries 0.5 marks) Answer all

16. The natural place where the organism or communities live is known as

(a) Niche b) Habit c) Home d) Habitat)

17. The percentage of O2 and carbon dioxide in the atmosphere is

(a) 20.95 % and 0.04 %, b) 24.2 % and 0.004%, c) 20.15 % and 0.2 % d) 78 % and 20.9%)

18. The amount of organic matter present at a given time per unit area is called

(a)standing crop, b) carbon content c) Carbon foot print d) Standing quality)

19..Bird sanctuary in Kerala

(Periyar, Thattekkad, Senthuruni, Aralam)

20. In India the Wild life protection Act was enacted in the year

(a) 1972 b) 1980 c) 1977 d) 1984)

21. The water vapour present in the unit volume of air is called

(Relative humidity, static humidity, Absolute humidity, Total humidity)

22In which zoogeographical realm India is present

(a) Oriental b) Ethiopean c) Nearctic d) Palearctic)

23 The pyramid of numbers is inverted in the case of

(Parasitic food chain, Grass land ecosystem, Forest ecosystem , Lake ecosystem)

SIXTH SEMESTER B. SC. DEGREE EXAMINATION

CORE COURSE IN ZOOLOGY

6B12ZLG : DEVELOPMENTAL BIOLOGY

Time-3 Hrs **Marks:40**

I. **Essay Questions (Each Question carries 8 marks) Answer any TWO**

1. Describe organogenesis of eye in frog.

2. Describe the salient features of 48 hour chick embryo.

3. Describe the development and functions of extra embryoic membranes in chick.

4. Describe the different types of Assisted Reproductive Techniques.

II. **Short Essay Questions (Each Question carries 4 marks) Answer any TWO**

5. What are primary and secondary egg membranes?

6. What are the different planes of cleavage?

7. Describe different types of placenta based on histological intimacy.

III. **Short answer Questions (Each Question carries 2 marks) Answer SIX**

8. Briefly describe the germ layers and their fate.

9. What is parthenogenesis? Describe any two types of parthenogenesis with example.

10. Explain morphallaxis with example.

11. Expalin neoteny with example.

12. Describe the influence of thyroxine on amphibian metamorphosis.

13. With the help of diagram, describe the structure of Graafian follicle.

14. Distinguish between radial and spiral cleavage with examples.

15. Explain homeotic genes.

IV. **Multiple choice Questions (Each Question carries 0.5 marks) Answer all**

16. Constriction experiment was conducted by Spemann to prove the importance of -------- in development.

(a. germ layers, b. organizer c. hormones d. yolk)

17. Metamorphosis of amphibians is triggered by environmental cues that act on the

(a. Thyroid, b. Pituitary, c. Hypothalamus d. Adrenals)

18. The process by which developing cells achieve their functional identity as liver, or muscle, or nerve is called:

(a. cleavage division b. Morphogenesis d. Differentiation e) blastulation)

19. The factor/s which disrupt normal embryonic development in man

(a. alcohol, b. Nicotine c. Ascorbic acid d. Both a & b)

20. ---------- is a term for milk production.

(a. Lactation, b. Parturition, c. Menstruation d) ovulation)

21. The lining of uterus to which the embryo implants is called as

(a. Coccyx, b. Trohoblast, c. Endometrium d) Myometrium)

22. Fertiliztion cone is formed during the ----------

(a. meeting of the gametes b. Penetration of sperm, c. amphimixis d. ovulation)

23. Germplasm theory was put forwarded by

(a. Weismann, b. Spemann, c. Vogt d. Gregor Mendel)

COMPLEMENTARY ELECTIVE

COURSES

GeneralRegulationsforComplementaryE l e c t i v e Courses(Zoology, Biological Techniques and Physiology)

TheComplementarycoursesruninthefirstfoursemesterswithonetheorycourseine ach semesterandonepracticalcoursespreadoverthefoursemesters. Howeverthepractical examwillbeconductedonlyattheendofthefourthsemester.Eachtheorycoursecarries2 creditsand40marksandthepracticalcourse4credits,i.e.atotalof12creditswithatotalof200 marks.

Attendance–
75%attendanceiscompulsoryfortheoryaswellaspracticalcourses,failingwhicha studentisnoteligibletoappearforuniversityexaminations.

Evaluation -

The evaluation of each paper shall contain two parts:

(i) Internal Assessment

(ii) External Assessment

The internal to external assessment ratio is 1:4.

Theory Papers

External Evaluation

The externaltheoryexamination of allsemesters shallbe conducted bytheUniversityat the end ofeach semester.

Scheme of Question Paper

Time; 3 Hours

Max. Marks: 32

V. Essay (Answer 2 out of 4)- 2x6= 12 marks

VI. Short essay (2 out of 3)-2x3=6 marks

VII. Short notes (6 out of 8)-6x2=12 marks

VIII. Objective Type (Multiple Choice) Questions - answer all questions - 4 x 0.5 = 2 marks

Internal Assessment

Internal evaluation is to bedonebycontinuous assessment

1 Testpapers(minimum2)5Marks

2 Assignment /Seminar/Viva 3Marks

Practical

Practical examination will be conducted at the end of fourth semester. There will be two external examiners and a skilled assistant (internal)

SchemeofPracticalExaminations

PracticalI

Time:3Hours Max.Marks: 32

MajorQuestion12marks

Minor Question6marks

Spotitems(5items)5x210Marks

Record 4 marks

Record –A practical record is compulsory for the course. Withouta certified practicalrecord,thestudentwillnotbeallowedtoappearforthe practicalexamination.Thepracticalrecordistobevaluedexternally.

Internal Assessment(8 marks)

Regularity/ Punctuality : 1 mark

Laboratory skill : 3 marks

Examination/ Viva : 2 marks

Record : 2 marks

Complementary Zoology

SCHEME

Sl. No	Sem	Course Code	NameoftheCourse	Credit	Hours/ Week	Exam Hrs.	Max.Marks		
							Int	Ext	Total
1	I	1C01ZLG	Diversityoflife-I Protistans and Non Chordates	2	2	3	8	32	40
2	I	4C05ZLG-P	Practical	*	2	-	-	-	
3	II	2C02ZLG	Diversityoflife-II Chordate Form and Function	2	2	3	8	32	40
4	II	4C05ZLG-P	Practical	*	2	-	-	-	-
5	III	3C03ZLG	Animal Physiology	2	3	3	8	32	40
6	III	4C05ZLG - P	Practical	*	2	-	-	-	-
7	IV	4C04ZLG	MedicalZoology	2	3	3	8	32	40
8	IV	4C05ZLG - P	Practical	4	2	3	8	32	40

SCHEMECOMPLEMENTARY
(BIOLOGICAL TECHNIQUES)

Sl. No	Sem	Course Code	NameoftheCourse	Credit	Hours/ Week	Exam Hrs.	Max.Marks		
							Int	Ext	Total
1	I	1C01BGT	GeneralLaboratoryTechniqu	2	2	3	8	32	40
2	I	4C05BGTP	Practical	*	2	-	-	-	
3	II	2C02BGT	LaboratoryEquipments and Techniques	2	2	3	8	32	40
4	II	4C05BGTP	Practical	*	2	-	-	-	-
5	III	3C03BGT	PreparationofBiological Specimens	2	3	3	8	32	40
6	III	4C05BGTP	Practical	*	2	-	-	-	-
7	IV	4C04BGT	AdvancedBiologicalTechniqu	2	3	3	8	32	40
8	IV	4C05BGTP	Practical	4	2	3	8	32	40

SCHEMECOMPLEMENTARY
(PHYSIOLOGY)

Sl. No	Sem	Course Code	NameoftheCourse	Credit	Hours/ Week	Exam Hrs.	Max.Marks		
							Int	Ext	Total
1	I	1C01PLY	BiologicalChemistry	2	2	3	8	32	40
2	I	4C05PLYP	Practical	*	2	-	-	-	
3	II	2C02PLY	CellBiology	2	2	3	8	32	40
4	II	4C05PLYP	Practical	*	2	-	-	-	-
5	III	3C03PLY	HumanPhysiology-I	2	3	3	8	32	40
6	III	4C05PLYP	Practical	*	2	-	-	-	-
7	IV	4C04PLY	HumanPhysiology-II	2	3	3	8	32	40
8	IV	4C05PLY	Practical	4	2	3	8	32	40

* Examination at the end of IV Semester

First semester BSc Degree

1C 01 ZLG DIVERSITY OF LIFE I

PROTISTANS & NON CHORDATES

Lecture hours: 2 hours/week.No. of credits :2 Total Hours : 36

CO1.Familiar with the non-chordate world that surrounds us.

CO2.Able to identify the invertebrates and classify them up to the class level with the basis of systematics

CO3. Understand the basis of life processes in the non-chordates and recognize the economically important invertebrate fauna.

Unit I:**Protista** – General characters of Protista
Distinction between 'Plant protists' and 'animal protists'.
Examples of animal protists –
Amoeba, Paramecium, Noctiluca, *Trichonympha* (Brief accounts)
Essay - Locomotion in protista. (5 hrs)

Unit II:**Animal kingdom**- Outlines of classification of Kingdom Animalia (1 hr)
a) **Phylum Porifera** – Salient features e.g., Ascon (1 hr)

b) **Phylum Cnidaria** – Salient features.
Class Hydrozoa – Salient features e.g., Physalia
Obelia – structural features and reproduction
Class Scyphozoa – Salient features e.g., Aurelia
Class Anthozoa – Salient features e.g., Adamsia
Coral forming cnidarians and their significance (4 hrs)

c) **Phylum Platyhelminthes** – Salient features
Class Turbellaria – Salient features e.g., Planaria
Class Trematoda – Salient features e.g., Schistosoma
Class Cestoda – Salient features – e.g., Taeniasolium (3 hrs)

d) **Phylum Nematoda** – Salient features
Mention free living & parasitic nematodes (of plants and animals) Pathogenic nematodes- Ascaris, Wuchereria (2 hrs)

e) **Phylum Annelida** – Salient features.
Class Polychaeta – e.g., Nereis
Class Oligochaeta – e.g. Megascolex
Megascolex – Study of external features, digestive,circulatory and excretory organs
Mention vermiculture and its significance

Class Hirudinea – eg. Hirudinaria (4 hrs)

f) **Phylum Arthropoda** – Salient features
Type Study –Penaeus- External morphology, structure of appendages, Digestive, respiratory, excretory, and reproductive systems (Detailed study of larval stages not expected)
Class Crustacea – Salient features – eg: Cancer
Class Myriapoda – Salient features of Scolopendra
Class Insecta - Salient features. Eg: Lepisma,Cockroach
Class Arachnida - Salient features e.g.: Heterometrus(scorpion)
Beneficial insects – *Apisindica, Bombyxmori, Tachardialaca.*
(Mention apiculture and sericulture) (10 hrs)

g) **Phylum Mollusca** – Salient features
Class Gastropoda – Salient features e.g.: Pila
Class Bivalvia – Salient features e.g.: Perna
Class Cephalopoda – Salient features e.g.: Sepia
Economic importance of mollusca. (3 hrs)

h) **Phylum – Echinodermata** – Salient features
Asterias – External features, locomotion and water vascular system.
Examples: Echinus, Holothuria (3 hrs)

ASSIGNMENT / SEMINAR TOPICS (Only for Internal Eval
uation)
1. Plant protists (Euglena, Chlamydomonas, Volvox)
2. Reproduction in Hydra.
3. Life cycle of *Taeniasolium*
4. Insect mouthparts – Biting and Chewing type.

REFERENCES
D.T.Anderson : Invertebrate Zoology, 2nd edition. Oxford U'ty Press.
EkambarnathAyyer : Manual of Zoology- vol I; S V Publishers.
Kotpal. R L : Modern Text Book of Zoology; Rastogi Publishers.
Michael A.Sleigh : Protozoa and other Protists; CBSPublishers, New Delhi.
Parker and Haswell : Text Book of Zoology Vol-1; Mac Millan.

Second Semester BSc. Degree

2C 02ZLG DIVERSITY OF LIFE – II

CHORDATE FORM AND FUNCTION

No of credits : 2 Lecture hours: 2 hours/week Total Hours : 36

Course outcomes

CO1: Understand the origin and evolutionary relationship in different subphyla of chordates.

CO2: Understand the diversity of chordates

CO3: Understand the unique characters of urochordates, cephalochordates and vertebrates

CO4: Recognize life functions of chordates

Unit I.Introduction-

Fundamental chordate characters. Classification into Subphylum Urochordata ,Cephalochordata and Vertebrata. Mention Ascidia and Branchiostoma.

(4hrs)

Unit II.Subphylum Vertebrata.

Classification as given below with important diagnostic features and brief account of examples.

A) Superclass Pisces – diagnostic characters. Chondrichthyes and Osteichthyes.

Scoliodonsorrakowah– external morphology, structure and working of digestive, respiratory, circulatory, nervous and urino-genital systems.

Examples – Trygon, Mugil, Etroplus, Rastrelliger, Sardinella, Channa

Economic importance of fishes (10hrs)

B) Superclass Tetrapoda – Diagnostic features. Structure of typical pentadactyl limb.

i) Class: Amphibia; Orders Apoda, Urodela and Anura

Examples: *Ichthyophis, Ambystoma, Bufo*.

ii) Class Reptilia: Orders- Chelonia, Squamata and Crocodilia

Examples: *Chelone*, Chamaeleon, *Typhlops, Hydrophis*.

Poison apparatus and venom of snakes. Identification of poisonous snakes of Kerala.

iii) Class Aves: Ratite and Carinate groups. Flightadaptations in birds.

Examples: *Struthio, Casaurius, Pavo, Columba, Aptenodytes*

iv) Class Mammalia: Order-MonotremataExample:Ornythorhynchus

Order: Marsupialia. Example *Macropus*

Order: Chiroptera- Example: *Pteropus*

Order: Primates: Examples: *Macaca, Hylobates, Homo*

Order: Carnivora: Examples*Panthera*sp.

Order: Artiodactyla: Example *Axis*

Order: Perissodactyla: Example *Equus*

Order:Proboscida: Example *Elephas*

Order: Cetacea: Example: *Balaenoptera*

Adaptations of aquatic mammals (whales and dolphins)

Brief account of dentition in mammals (18 hrs)

Unit III

Early chordate development. Structure of mammalianegg and sperm. Types of eggs based on quantity and distribution of yolk.

Types of cleavage. Brief accounts of blastulation, gastrulation and germ layer formation in vertebrates

Embryonic membranes and their functions (4hrs)

SEMINAR / ASSIGNMENT TOPICS

(Only for Internal evaluation)

1 Aquatic adaptations of fishes.
2 Structure of vertebrate eye and ear.
3 Structure of feather
4 Types of feathers

5 Endangered mammals of India

REFERENCES

Parker and Haswell : A Text Book of Zoology, Vol 2;Orient Longman.
EkambarnathAyyer : Manual of Zoology- Vol II; S V Publishers.
Jordan and Verma : Chordate Zoology; S.Chand& Co.
Kotpal R L : Vertebrate Zoology; Rastogi Publications.
Verma and Agarwal : Chordate Embryology; S.Chand.

Second Semester BSc. Degree
Course Code: 3CO3ZLG
Animal physiology
credits:2`Lecturehours:3hours/weekTotal Hours 54

COURSE OUTCOMES

CO1. Understand the function of various systems at cellular and system levels
CO2. Understand the mechanisms that work to keep the body alive and functioning
CO3. Apply the knowledge to lead a healthy life

1. Nutrition & Digestion (8 Hrs)
1.1. Types of nutrition - Autotrophic, Heterotrophic, Holozoic, Saprozoic and Parasitic. Symbiotic digestion (pre and post gastric).Compound stomach in ruminants
1.2. Digestion and absorption of carbohydrates, proteins and lipids in man (role of enzymes and hormones).

2. Gas exchange and internal transport (8 Hrs)
2.1. Respiratory organs in different groups of animal kingdom. Integument, Gills, Tracheal system,Lungs (only a brief account).
2.2. Respiratory pigments in animals – Haemoglobin,Haemerythrin, Haemocyanin and Clorocruorin.
2.3. Transport of gases
2.4. Types of heart(Neurogenic and myogenic)
2.5. Pacemaker and specialised conducting fibres

3. Excretory system (8 Hrs)
3.1. A brief account of excretory organs in animals.Contractile vacuoles, Protonephridia,Nephridia, Malpighian tubules, Antennary glands, Kidneys (Mention Pronephros,Mesonephros and Metanephros)
3.2. Ammonotelism, Uricotelism and Ureotelism.Urea Cycle
3.3. Mechanism of urine formation in man

4. Nervous system (8 Hrs)
4.1. Types of neurons. Glial cells
4.2. Organization of nervous system in vertebrates: central and autonomous system
4.3. Mechanism of nerve impulse transmission

5.Locomotion (8 Hrs)

5.1 Striated(Ultrastructure expected) and non striated muscle
5.2 Mechanism of muscle contraction

6. Receptors and Sense organs (2 Hrs)

6.1. Photo receptor – rods and cones
6.2. Rheo receptor – Lateral line sense organ
6.3. Olfacto receptor – Jacobson's organ
6.4. Auditory receptor – Organ of corti
6.5. Thermo receptor – Ampullae of Lorenzini

7. Endocrine System (4 Hrs)

Hormones released by major endocrine glands and their functions: Hypothalamus, Pituitary, Thyroid, Parathyroid, Thymus, Pancreas and Adrenal glands.

8. Reproduction (8 Hrs)

8.1. Types of asexual reproduction: fission, regeneration and parthenogenesis
8.2. Menstrual cycle
8.3. Hormones released by gonads and placenta and their functions

REFERENCE BOOKS: ANIMAL PHYSIOLOGY

1. Guyton, A.C. (2015).Text Book of Medical Physiology, W.B. Saunders co.

2. Hoar, W.S.(1983). General and Comparative Physiology, Prentice Hall.

3. Prosser,C.L.(1978). Comparative Animal Physiology. W.B. Saundersco.

4. Schmidt Nielsen, K. (1994). Animal Physiology: Adaptation and Environment. Cambridge University Press

Fourth Semester BSc Degree

4C04ZLG

MEDICAL ZOOLOGY

credits:2Lecture hours:3 hours/weekTotal Hours 54

Course outcomes

CO 1:
Understandingofthevariouscausativeorganismsandfactorsandalsohowandwhatpreventive measurescanbeadopted againstthese.

UnitI. Diseases–Mentioncommunicablediseases,noncommunicablediseases;hereditary and nutritional diseases, metabolic diseases, allergic diseases, zoonoticdiseases, occupational diseases, sexually transmitted diseases, diseases transmittedthrough bloodtransfusion,gerontologicaldiseasesandautoimmunediseases.(03hrs)

UnitII. ParasiticDiseases:Brieflife cycle(stressinginfectivestageandmodeofinfection), pathogenicityandprophylaxisofthefollowingpathogenicProtists:*Entamoebahistolytica, Plasmodium vivax*. Helminthiasis: Brief lifehistory, mode ofinfection,pathogenicity

andprophylaxisofthefollowingparasites:*Schistosomahaematobium*,*Ancylostomaduodenale, Ascaris lumbricoides*and *Wuchereria bancrofti*. Diseasecausing arthropods: Clinicalmanifestations,treatmentand prophylaxisof–*Sarcoptesscabi,Demodexfolliculorum*. (15hrs)

Unit III. Viral, Bacterialand fungal diseases. Very briefaccounts of causativeorganism,symptoms,labdiagnosisandprophylaxisofRabies,Chickenpox,Hepatitis,AIDS,Tetanus,Cholera,Typhoid,Mycosis,(05hrs)

UnitIV.InheritedDiseases.Geneticbasisofinheriteddiseases.Normalhumankaryotype; numericalandstructuralaberrationsofchromosomes.Aneuploidy,deletion(terminaland interstitial), inversion (peri and para centric), translocations (balanced,unbalancedandrobertsonian)ClinicalfeaturesandcausesofTrisomy21(mentionmaternalageeffect),Turner'ssyndrome, Klinefelter'sSyndrome, andCriduchatsyndrome. Clinicalsymptoms,cause andmode of inheritance ofNeurofibromatosis,Myotonic muscular dystrophy(Autosomal dominants); Albinism,Phenylketonuria, Alkaptonuria, Sickle cell anaemia(autosomal recessives);Haemophilia, Colour blindness (X linked) Mention Alzheimer'sdiseaseasanexampleofmultifactorialtrait.
(15hrs)

Unit V. Life stylerelated diseases. Mention the role ofenvironmental factorsin Hypertension, cardiovasculardiseases,DiabetesmellitusandObesity.Mentiontheroleofhereditya predisposingfactor. (05hrs)

UnitVI. Immunityanddiseases.Immuneresponse:Primary,Secondary,Humoral,andCell mediated. Autoimmune diseases: Type 1 Diabetes Mellitus, Myasthenia Gravis. Mentiongraftrejection.Reasonsforautoimmuneresponses.(05hrs)

UnitVII. Cancer.Typesofcancer.Characteristics ofcancercells.Carcinogens.OncogenesandAntioncogenes.(03hrs)

UnitVIII. DiagnosticToolsandTechniques.BriefaccountsofEEG,ECG,UltraSonography,Amniocentesis,ChorionicVillusBiopsy.(03hrs)

REFERENCES

AnilAggarwal:ModernDiagnostics;NationalBookTrust.
Chakravarthy&Chakravarthy:HandBookofClinicalPathology.

Chaterjee K D: Parasitology- Protozoology and Helminthology; ChatterjeeMedical

Publishers.Kolkatta.

PRACTICAL

4C05ZLG(P)

Lecture hours: 2 hours/week in each semester (I to IV),No. of credits: 4

TAXONOMY. Study of the following specimens in the laboratory by making simple sketchesand preparing notes stating the scientific names, classification, morphological and adaptive features, biological significance, economic importance etc.

Protista (2) , Porifera (1) Cnidaria (3) Helminthes (3) Annelida (3) Arthropoda (6) Mollusca (3)Echinodermata (3) Pisces (4) Amphibia (3) Reptilia (3) Aves (1) Mammalia (1).

Study of the any four specimens of parasites with simple outlinesketches and notes of importance. (Hosts, pathogenicity, infective stage, mode of infection,prophylaxis)

Identification of any four genetic diseases from photographs. Relevant notes to be recorded.

Instead of drawings, photocopies of pictures may be pasted in the record.

- Trisomy 21 - Turner's syndrome

- Albinism - Neurofibromatosis

- Sickle Cell Anaemia (using photograph/ drawings of RBC)

MOUNTING. The record should carry neat, labelled diagrams.

- Earthworm - body setae (in situ).

- Prawn - appendages.

- Honey - bee mouthparts.

-Honey bee pollen baskets

- Shark - placoid scales. Cycloid Scales

- Lepidoptera Wing Scale

EXPERIMENTS

1. Preparation of blood smear to identify formed elements (Major)
2. Differential count of WBC (Major)

3. Urine analysis for glucose, albumin and ketone bodies (Major)

4.Determination of blood group (Minor)

5. Measurement of blood pressure using sphygmomanometer (Minor)

6. Measurement of human pulse rate (Minor)

7. Estimation of Hb using haemoglobinometer (Sahli's haemoglobinometer)(Minor)

BIOLOGICAL TECHNIQUES

I SEMESTER
GENERAL LABORATORY TECHNIQUES
1C 01BGT
No of credits: 2
Hours: 2 hours / week, Total Hours : 36

Course outcomes

CO 1 : Understand the basic laboratory techniques

CO 2 :Develop an understanding of the methods used in routine lab work.

Unit I: Distilled Water: Types of distilled water - grade 3, grade 2 and grade1 and their uses;
ion-exchangers: principle and uses; brief account on anion, cation and amphoteric exchangers (3 hrs)

Unit II:Cleaning and sterilization of glassware: Cleaning of new glassware; general and special cleaning procedures; cleaning of pipettes and burettes; preparation of cleaning solutions (any two).Sterilization of glassware: sterilization by heat (dry heat and moist heat), by chemicals and by radiations (brief accounts only). (4 hrs)

Unit III.Solutions: Definition of solute and solvent; preparation of molar, molal, normal and
percentage solutions; define ppm, ppb and ppt. (2hrs)

Unit IV. pH: Definition; methods for determining pH of samples - pH meter, pH indicator paper and pH indicator solutions; significance of determining pH in biological laboratories; pH meter: Working mechanism; various types of electrodes-glass electrode and reference electrode (calomel electrode). (4 hrs)

Unit V.Buffer solutions: Definition, mechanism of buffer action, buffer solutions commonly used in biological laboratories- acetate, phosphate and TRIS buffer (brief account on preparation method and uses). (2hrs)

Unit VI. Organic solvents: Brief accounts on ethanol, methanol, ether, chloroform, benzene
and xylene. (2 hrs)

Unit VII. Tissue techniques: Tissue techniques for histological and histochemical studies; fixation, washing, dehydration, clearing, infiltration, embedding (paraffin method). (3 hrs)

Fixatives: Aims of fixation; chemical fixatives-simple and compound fixatives (their preparation methods and uses only). (2 hrs)

Microtomy: Microtome - rotary microtome and cryostat; brief account on working mechanism and uses of rotary microtome; problems associated with microtomy (mention the problems, their reasons and remedies). (2 hrs)

Stains: Brief accounts on auxochrome and chromophoregroups; mordants and lakes;histochemical stains-preparation methods and staining procedures for proteins, carbohydrates, nucleic acids and lipids; uses of histochemical stains. (4 hrs)

Special stains used in animal histological studies: Haematoxylin and Eosin, their preparation methods and staining procedure. (2hrs)

Unit VIII. Microbiological techniques: Culture media preparation-mention solid and liquid culture media; artificial culture media (any one medium for bacteria, protozoan, fungi, and algae): sterilization of culture media (brief account only). Staining of bacteria: simple, differential (Gram staining and acid fast staining), negative and special staining techniques (procedure and uses only). (4 hrs)

Unit VII.Blood grouping: ABO and Rh; principle, methodology (forward and reverse typing) and significance of blood grouping. (2 hrs)

REFERENCES:

1. Humason G L, 1972. Animal Tissue techniques. (3rd edition). W H Freeman & Co., San Francisco.
2. Jayaram J, 1996. Laboratory Manual in Biochemistry . New Age Int., New Delhi.
3. Mukherjee K L,1998. Medical Laboratory Techniques -Vol.I,II& III. Tata McGraw Hill Pub.
4. Pelczar M J, E C S Chan & Noel R Krieg, 1993. Microbiology:Concepts& Applications. Mc Graw Hill Inc., New York.
5. Puri B R, L R Sharma & M S Pathania, 1994. Principles of Physical Chemistry: Vishal Publishing Co.
6. Sarada S, 1996. College Microbiology. Vardhana Pub., Bangalore.
7. Sharma P D, 1997. Microbiology (2nd edition). Rastogi publications, New Delhi.
8. Tewari K S, S N Mehrotra& N K Vishnoi, 1994. A Text Book of Organic Chemistry: Vikas Publishing House.
9. Wadher B J &Bhoosreddy G L (1995). Experiments with Micro organisms: Himalaya Pub., New Delhi.
10. Wadher B J &Bhoosreddy G L, 1995. Manual of Diagnostic Microbiology. Himalaya Pub., New Delhi.
11. Subramanyan N S, 1996. Biophysical Chemistry-Principles and Techniques. Vikas Publishing Co.

II SEMESTER
2C 02 BGT LABORATORY EQUIPMENTS AND TECHNIQUES
Lecture hours: 2 hours/ week, No of credits: 2

Course outcomes
CO 1 : Acquire sound knowledge on the basic principles of common equipment used in biological laboratories

Unit 1. Microscope: Description and uses of light and phase contrast microscope; brief account on ocular and stage micrometer and camera lucida; mention immersion oils;advantage of using oil immersion objective; magnification and resolution; factors influencing resolution; some common problems associated with microscopy, brief account on electron microscopy. (7hrs)

Unit II. Temperature sensing devices: Different types of thermometers-liquid in glass thermometer (mercury thermomter, alcohol thermometer, clinical thermometer, Six thermometer), deformation type thermometers (Bimetallic strip and Bourden's tube) and electrical thermometer. Thermocouple, thermostat, incubator, hot air oven, water bath, magnetic stirrer (brief accounts on their principle, working mechanism and uses. (8hrs)

Unit III. Chromatography and mass spectrometry (MS): Methods and applications of paper, thin layer (TLC) and column chromatography; brief accounts on gas chromatography (GC), high pressure liquid chromatography(HPLC) and mass spectrometry. (6hrs)

Unit IV. Electrophoresis: Methods and applications of paper and gel electrophoresis (Polyacrylamide (PAGE) and Agarose gel electrophoresis). (4hrs)

Unit V. Colorimeter and Spectrophotometer: Principles and uses; brief account on UV, visible and infrared spectrophotometers. (3 hrs)

Unit VI. Centrifuge: Principle and uses; brief accounts on types of centrifuges: clinical, refrigerated and ultracentrifuges. (2hrs)

Unit VII. Balances: Two pan balances-Analytical and physical; single pan balance; chances of errors in weighing-lever arm error and scale deflection error. (3hrs)

Unit VIII.Computer: Components of computer system; brief account on how to use a
computer (mention Windows Operating System); applications of computers in biological laboratories and introduction to internet (brief accounts only). (3 hrs)

REFERENCES:

1. Mukherjee K L,1998. Medical Laboratory Techniques -Vol.I,II& III. Tata McGraw Hill Pub.
2. Roy K N. A Text Book of Biophysics. New Central Book Agency Pub.
3. Ackerman E. Biophysical Science. Prentice Hall Inc.
4. Banerjee P K. Introduction to Biophysics. S Chand Pub.
5. Sharma V K, 1991. Techniques in Microscopy & Cell Biology. Tata Mc Graw Hill Pub.
6. Puri B L, L R Sharma & M S Pathania, 1994. Principles of Physical Chemistry: ShobhanlalNaginchand& Co.
7. Tewari K S T, S N Mehrotra& N K Vishnoi, 1994. A Text Book of Organic Chemistry: Vikas Pub.
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9. Cotterill R, 2012. Biophysics-An Introduction. John Wiley & Sons Ltd. Pub.
10. Subramanyan N S,1996. Biophysical Chemistry- Principles and Techniques. Vikas Pub. Co.
11. Miller M, 2007. Absolute Beginners Guide to Computer Basics (4th edition). Que Pub.

III SEMESTER

3C 03 BGT

PREPARATION OF BIOLOGICAL SPECIMENS

Lecture hour: 3 hours / week.No of credits : 2

Course outcomes

CO 1 : Acquires basic knowledge on preparation of lab specimens for display in biology museums and also for other laboratory purposes

Unit I. Herbarium techniques: Collection of plant specimens (methods and equipment
required); preservation, mounting and storage techniques (4hrs)

Unit II. Taxonomic collection: Major ecological zones-Marine, inter-tidal, freshwater and terrestrial zones;factors affecting zonation and distribution of animals, equipment required for collecting animal specimens and collecting methods from each zone; insect collection methods; brief accounts on different types of nets, samplers, hip boot, harpoons, traps, funnels, killer bottle, aspirator.(9 hrs)

Preservation of collected specimens: Preservation methods (any one method for each group) for protozoans, coelenterates,sponges, helminthes, annelids, arthropods, molluscs, echinoderms, fishes, amphibians, reptiles, birds and mammals. (5 hrs)

Unit III. Preparation of museum specimens (animal): Display methods including wet (in liquid preservatives-formalin/alcohol) and dry (on microslides and in display boxes) preparations (brief accounts only); pinning of butterflies and moths. Preparation of life cycle of specimens for museum display (in formalin)- one invertebrate (mosquito) and one vertebrate (frog) specimen. (4 hrs)

Unit IV. Vertebrate skeletal techniques : General methods; clearing and staining techniques
(using Alizarinred); brief accounts on X-ray and dermestid techniques; brief accounts onstandard skeletal techniques (fleshing, maceration, boiling, degreasing, mounting). (5hrs)

UNIT V. Taxidermy: Methodology (of mammals and birds). (3 hrs)

Unit VI. . Maintenance of living organisms: Aquarium and terrarium. (4 hrs)

Unit VII. Cell division in animal and plant cells: Different stages of mitosis (in onion root tip cells) and meiosis (in grasshopper testis cells); sources of materials to show cell division; preparation of temporary and permanent slides to demonstrate various stages of cell division; mitotic inhibitors (brief accounts). (8 hrs)

Unit VIII. Preparation of blood smear: Preparation of blood film-thick and thin smear; staining of blood smear with Leishman stain; total count and differential count; identification of WBCs; significance of blood smear preparation. (6 hrs)

Unit IX. Biochemical (quantitative) estimation: Blood sugar, blood urea and serum bilirubinany one method each; mention their clinical significance. (6 hrs).

REFERENCES:

1.Singh H B and Subramaniam B. Field Manual on Herbarium Techiques. Published by National Institute of Science Common, New Delhi.
2. Vieria K S, Vieria WLS and Alves R, 2015. An introduction to Zoological Taxonomy and the Collection and Preservation of Zoological Specimens.
3. Jairajpuri M S, 1990. Collection and Preservation of Animals. Zoological Survey of India, Calcutta, Pub.
4. Proger, L W, 1951. Preparation of Museum Specimens: in Annals of Royal College of Surgeons of England, vol 8 (5): pages 388-391.
5. Frederick C H, 1975. Techniques for Skeletonizing Vertebrates in American Antiquity, vol 40(2): pages 215-219.
6. Maynard C J, 2002. Manual of Taxidermy. Botson S E, Cassino& Co. Pub.
7. Broekel R, 1982. Aquariums and Terrariums. Children Press Pub.
8. De Robertis E D P & E M F De Robertis, 1990. Cell and Molecular Biology. Wavelry Int Pub.
9. Mukherjee K L,1998. Medical Laboratory Techniques -Vol.I,II& III. Tata McGraw

Hill Pub.
10. Odum E P,1996. Fundamentals of Ecology. Nataraj Publications/WB Saunders Co.,USA.
11. Sadasivam S & A Manickam,. Biochemical Methods (2nd edition): New Age Int., Delhi.
12. Vogel, 1996. Vogel's Text Book of Quantitative Chemical Analysis (5th Ed.). Publisher Longman.

IV SEMESTER

4C 04BGT ADVANCED BIOLOGICAL TECHNIQUES:

Lecture hours: 3 hours/week, No of credits: 2

Course outcomes

CO 1 : Get exposed to some of the advance techniques in biology

CO 2 :Familiarize the student with the modern innovative techniques and terminologies currently used.

Unit I.Restriction enzyme and their uses (2hrs)

Unit II. Hybridization Techniques: Southern blotting, Northern blotting, Western blotting and DNA fingerprinting (methodology and applications). (8 hrs)

Unit III. Methodology for isolation of total RNA and DNA;complementary DNA (cDNA) synthesis and cloning; Polymerase chain reaction (PCR), Real time PCR (RT-PCR), Random amplification of polymorphic DNA (RAPD), Restriction fragment length polymorphism (RFLP), Amplified fragment length polymorphism (AFLP). (11hrs)

Unit IV. X-ray crystallography: a brief account on principle, methodology and uses. (2hrs)

Unit V.Tissue culture: Methodology and applications (Plant tissue culture; embryo culture in plants; cell culture in animals - brief account only). (7hrs)

Unit VI.Immunological techniques: Structure of IgG immunoglobulin; types of immunoglobulin; visualization of antigen-antibody reaction; brief accounts on precipitation, agglutination, immunoelectrophoresis,immunocytochemistry and immunohistochemistry techniques. (7 hrs)

Unit VII.Production of antibodies: Monoclonal antibodies-hybridoma technology; production of polyclonal antibodies (any one method) and applications. (3hrs)

Unit VIII. DNA barcoding: Definition, brief account on methodology and applications; genes used for barcoding in plants and animals. (2 hrs)

Unit IX. Stem cells: Definition, brief account on types of stem cells (primordial germ cells, embryonic stem cells; amniotic fluid derived stem cells, cord blood stem cells) and their applications. (2 hrs)

Unit X. Gene therapy: Definition, Types of gene therapy-somatic and germ line; brief accounts on process of gene therapy and applications; mention gene editing. (2hrs)

Unit XI.Introduction to Bioinformatics. (2 hrs)

Unit XII.Types and sources of radiation. Effects on biological systems. Isotopes-definition, isotopes of common biological use; carbon dating; techniques for detection of radio isotopes (autoradiography and Geiger counter methods)-brief accounts. (6hrs)

REFERENCES:

1. Cotterill R, 2012. Biophysics-An Introduction. John Wiley & Sons Ltd. Pub.
2. Das H K, 2008. Text Book of Biotechnology (3rd edition). Wiley India Pub.
3. Desmond S T Nicholl, 1996. An Introduction to Genetic Engineering (3rd edition), Cambridge Univ. Press.
4. Gupta P K, 2010. Elements of Biotechnology. Rastogi Publications, New Delhi.
5. Ignacimuthu, 1996. Applied Plant Biotechnology. Tata McGraw Hill Pub. Co.
6. Nandini Shetty, 1999. Immunology. New Age Int., New Delhi.
7. Reinett J & Bajaj Y P S, 1997. Applied Aspects of Plant Cell, Tissue & Organ Culture. NarosaPublishing House, Bombay.
8. Talwar G P & Gupta S K, 1993. A Hand Book of Practical and Clinical Immunology. Vol. I & II, CBS Publ. & Distributors.
9. Wilson K & Walker J, 2010. Principles and Techniques of Biochemistry and Molecular Biology: Cambridge Univ. Press.
10. Roy K N. A Text Book of Biophysics. New Central Book Agency Pub.
11. Ackerman E. Biophysical Science. Prentice Hall Inc.
12. Banerjee P K. Introduction to Biophysics. S Chand Pub.
13. Watson J D et al., 2017. Molecular Biology of the Gene (7thedition). Pearson Pub.
14. Lopez, Ida, Ericksen and David, 2012. DNA Barcodes: Methods and Protocols. Springer Pub.
15. Slack J M W, 2017. The Science of Stem Cells. John Wiley & Sons, Inc.
16. Lesk A M, 2002. Introduction to Bioinformatics, 4th edition. Oxford Pub.
17. Butler M, 2005. Animal Cell Culture and Technology (2ndedition). Bios Scientific Pub.
18. Mukherjee K L, 1998. Medical LaboratoryTechnology-Vol. I, II & III: Tata Mc Graw Hills Int. Pub.

BIOLOGICAL TECHNIQUES

4C05BGT (P) PRACTICAL

Lecture hours: 2 hours/week in all semesters (I to IV) No. of credits: 4, Total Marks: 32

I. Preparation method of the following:- (Demonstration)

a) Standard buffer solution- Acetate and Phosphate b) Fixatives – Bouin's, Carnoy's, Schaudinn's.

c) Stains – Cytological, anatomical, histological and histochemical (one each) d) Paraffin blocks of tissues for sectioning- fixing, washing, dehydration etc. Record should carry notes of the preparation methods.

II. Operation of the following equipments

a) Compound microscope b) Phase contrast microscope c) Colorimeter d) Spectrophotometer e) pH meter f) Hot air oven

g) Incubator h) Incubator i) Water bath

j) Autoclave k) Distillation apparatus l) Deioniser

m) Analytical balance (2 pan) n) Electrical balance (monopan)

o) Microtome p) Magnetic stirrer q) Centrifuge

Record should carry sketches and notes on the principle and uses.

III. Experiments

Colorimetry- To find the concentration of given sample solution using standard graph. (major)

b) Spectrophotometry- To find wavelength at which maximum % transmission occurs in the given sample solution (major).

c) Double staining- To stain the given slide of animal tissue using haematoxylin-eosine (demo)

d) Microtomy – To take serial sections of the given tissue and spread them on glass slide. (minor)

e) Micrometry- Measure dimensions of microscopic objects. (Minor)

f) Scientific drawing – To draw specimens using camera lucida. (Minor)

g) Vital staining – staining of buccal epithelium and mitochondria. (Minor)

h) Staining – smear preparation and staining of bacteria (minor)

i) Detection of abnormal constituents of urine – glucose, albumen, ketone bodies.(major)

IV. Method of preparation of museum specimens

a) Animal specimens – any 5 b) Plant specimens – any 5

Record should carry sketches and notes on method of preparation.

PHYSIOLOGY

I SEMESTER
1C01 PLY BIOLOGICAL CHEMISTRY
Lecture hours: 2hours/week Total Hours 36 credit 2
Course outcomes

CO 1 : Get a comprehensive idea about the basic concepts of biochemistry

Unit I - Introduction

The Chemical elements of living matter-biological molecules, Protoplasm-Colloidal nature covalent bonds, Polar and non-polar molecules, Non-covalent bonds, ionic bonds, hydrogenbonds. (3 hours)

Unit II - Water

Biological properties of water and its significance , dipolar nature,dissociation of water, concept of pH, Buffers, Henderson- Hassel Balch equation (3 hours)

Unit III -Proteins, Peptides and amino acids

Classification of amino acids, Primary, secondary and tertiary structures of proteins, Biological functions of Protein. (6 hours)

Unit IV – Carbohydrates

Monosaccharides, disaccharides and polysaccharides, trioses, tetroses, pentoses, hexoses aldosugars and ketosugars, heteropolysaccharides-biological functions of carbohydrates. (6 hours)

Unit V- Fats & Fatty acids

Classification of fatty acids, Simple fats, saturated and unsaturated fats, classification of Lipids, Biological functions of lipids (4 hours)

Unit VI- Bioenergetics

The laws of thermodynamics and concept of entropy, free energy (2 hours)

Unit VII –Enzymes

Introduction to enzymes, properties, apoenzyme, holoenzyme, prosthetic group, active site, isoenzymes, zymogen, co enzymes, enzyme nomenclature and classification, Lock and Key model, Induced fit model, factors affecting the velocity of enzyme action- enzyme concentration, substrate concentration, pH, temperature. Enzyme inhibition- reversible, irreversible, competitive, non competitive, uncompetitive and end product inhibition. Michaelis- Menten equation and Michaelis constant (6 hours)

Unit VIII - Basal metabolism

BMR and factors affecting BMR,Interrelationship between carbohydrates, proteins and lipid metaboism, role of liver in metbolism. (6 hours)

REFERENCES

AwaparaJ : Introduction to Biological chemistry; Prentice-Hall, India.
Nelson :Leninger's Principles of Biochemistry; Ane Books.
Rastogi : Biochemistry; Tata McGraw Hill.
Srivastava H S : Elements of Biochemistry; Rastogi Publications.
VeerakumariL : Biochemistry; MJP Pub

II SEMESTER

2CO2PLY CELL BIOLOGY

Lecture hrs: 2 hrs /week

Course outcomes

CO 1 : Getan over view of the basic concepts and techniques involved in the study of cells and an insight in to the complexity of the cellular machinery

Unit –I

Introduction to the study of cell biology- The discovery of cells, Basic properties of cells, Celltheory and its modern concept, Two fundamentally different classes of cells- characteristicsthat distinguish prokaryotic and eukaryotic cells (2 hrs)

Unit- II

Structure and chemical composition and functions of plasma membrane, plasma membrane models- fluid -Mosaic model, sandwich model and unit membrane concept, passive and active transport mechanisms of substances across the cell membrane- osmosis, simple and facilitated diffusion, ultrafiltration, phagocytosis,pinocytosis(6hrs)

Unit -III

Mitochondria- structure, chemical composition and functions-Oxidative phosphorylation ETS and ATP formation. (3 hrs)

Unit -IV

Structure, chemical composition and functions of cytoplasmic organelles--The Endoplasmic reticulum, The golgicomplex, Lysosome, Peroxisome and Glyoxysomes, Plant cell vacuoles and chloroplast types of transport vesicles-COP I, COP II and clathrin coated vesicle
(7 hrs)

Unit -V
Structure and functions of cell nucleus, chromosome- morphology, chromosomal DNA packing-nucleosome model, Giant chromosomes-polytene and lampbrush chromosomes, DNA replication-semiconservative method, Nucleolus structure and functions, Control of gene expressions inEukaryotes, Ribosomes- structure, chemical composition,types and biological functions- protein synthesis(brief account -transcription and translation) (8 hrs)
Unit -VI
The cytoskeleton and cell motility-structure and functionof microtubule, microfilament andintermediate filaments, Centriole, cilia and flagella . (5 hrs)
Unit -VII
Cellular reproduction, Cell cycle –M-phase,mitosis and Cytokinesis, Meiosis. (5 hrs)

REFERENCES
De Robertis : Cell and Molecular Biology; Holt-Saunders.
Gupta : Cell and Molecular Biology; Rastogi Pub.
Karp : Cell Biology; McGraw Hill.
Powar : Cell Biology; Himalaya Publishing House
Verma& Agarwal: Cytology; S. Chand.

III SEMESTER
3C 03 PLY HUMAN PHYSIOLOGY I
Lecture hrs: 3hrs/week

Course outcomes
CO 1 : Develop a comprehensive idea of the physiological features of the human body.
CO 2 : a clear ideaabout the functioning of the various systems in the human body

Unit I- Nutrition
The constituents of food, Dietary requirement of carbohydrate, proteins, fats, vitamins andminerals,balanced diet, Malnutrition, common deficiency diseases,Digestion and absorption of carbohydrates, proteins and fat, general structure of digestive glands, Gastro- Intestinal hormones, Gastric movements. Nervous and hormonal control of digestion. (10 hrs)

Unit II- Respiration
Definition, Mechanism of respiration, Pulmonary air volumes, physiology of gaseous exchange in lungs & tissues. Transport of oxygen and carbon dioxide. oxyhaemoglobin

curve, Effect of temperature &pH on oxyhaemoglobin curve,Neuro-physiological control of respiration- respiratory disturbances- apnoea,dyspnoea, hypoxia, hypo &hypercapnea, asphyxia, carbon monoxide poisoning.Acclimatisation-adaptation to high altitude. Oxygen toxicity. (10 hrs)

Unit III- Body fluids & circulation
Blood-composition & function. Importance of analysis of blood ESR, anaemia, leucopenia, polycythemia. Blood groups, blood clotting mechanism. Lymph & lymphatic system. Spleen-structure &function. Heart- structure &functions.Conducting system of heart, cardiac cycleand its control. cardiovascular problems-artetiosclerosis, ischaemia, anginapectoris,atherosclerosis, ASD, VSD, myocardial infarction, coronary thrombosis, ventricularfibrillation, blood pressure. (10 hrs)

Unit IV- Excretion
Histology of human nephron, physiology of urine formation. Counter current mechanism. Kidney diseases, stones in kidney and urinary tracts. Renal hypertension, nephrosis,nephritis, renal failure. Brief note on dialysis. (9 hrs)

Unit V-Nervous coordination
Types of neurons. Giant nerve fibers, transmission of nerve impulse, neurotransmitters, Sympathetic& parasympathetic system. Motor and sensory areas of brain. physiology of vision, hearing & balancing. cutaneous sense receptors. (10 hrs)

Unit VI-Human immune system
Specific and non specificdefences. The lymphocytes and immunity.Humoral&cell mediatedimmunity. (3 hrs)

Unit VII- Homeostasis
Homeostasis, temperature regulation & pyrexia. (2 hrs)

REFERENCE BOOKS: ANIMAL PHYSIOLOGY

1. Guyton, A.C. (2015).Text Book of Medical Physiology, W.B. Saunders co.

2. Hoar, W.S.(1983). General and Comparative Physiology, Prentice Hall.

3. Prosser,C.L.(1978). Comparative Animal Physiology. W.B. Saundersco.

4. Schmidt Nielsen, K. (1994). Animal Physiology: Adaptation and Environment. Cambridge University Press

IV SEMESTER
4 CO 4 PLY HUMAN PHYSIOLOGY II
Lecture hours -3 hours /week

Course outcomes
CO 1 : Develop basic ideas on first aid

CO 2 :Develop interest in public health care

Unit I - Locomotion
Skeletal joints, bones of limbs
Muscle –structure, sarcotubular system, contractile protiens.
Electrochemical changes responsible for contraction & relaxation of muscle.
Muscle twitch ,tetanus, isometric & isotonic contraction.
Action potential curve. All or none law. Fatigue, rigor mortis. (12 hrs)

Unit II- Reproduction
Reproduction & development. Structure of ovary and testis
Structure of ovum and sperm. Oogenesis and spermiogenesis, human menstrual cycle and hormonal control. fertilization, cleavage, blastocyst formation, implantation, placenta, hormonal control of pregnancy, gestation, parturition and lactation. (12 hrs)

UnitIII- Endocrine glands
Endocrine glands, structure, hormones and their function. (10 hrs)

Unit IV-First aid
Artificialrespiration.Firstaidforburns, snake bite, drowning&accidents. (5 hrs)

Unit V-Ageing
Physiological basis of ageing. (5 hrs)
Unit VI-Public health and awareness
Smoking and its effects
Alcoholism and its effects
Drug addiction and its effects
Cancer and carcinogens
Sexually transmitted diseases - Hepatitis, HIV, communicative diseases-water borne and air borne diseases. (10 hrs)

REFERENCES
Chatterjee CC : Human Physiology vol -I & II; Medical Allied Agency
Hoar W S : General and Comparative Physiology; Prentice Hall.
Park & J E Park : Social and Preventive Medicine.
Rastogi S C : Essentials of Animal Physiology; New Age Int'l Pub.
Subramaniyam.S, Madhavankutty K, Singh S D. : Textbook of Human Physiology; S Chand.

PRACTICAL
PHYSIOLOGY
4C O5 PLY(P)

Microtechniques
Study of compound microscope
Stage and ocular micrometers

Cytology

Squash preparation of onion root tip to study mitotic stages(minor)
Preparation of salivary gland chromosomes of *D. melanogaster*(Demo)
Smear preparation of buccal epithelium(minor)
Preparation of blood smear and differential count of WBC(major)
Total count of WBC by hemocytometer. (Demo)
Total count of RBC by hemocytometer. (Demo)

Biochemistry

Glucose estimation by calorimeter. (Demo)
Protein estimation by calorimeter. (Demo)
Paper chromatographic separation of amino acids. (Demo)
Qualitative test for carbohydrates. (Major)
Qualitative test for protein. (Major)
Qualitative test for fat. (Major)

Physiology

Effect of temperature/ pH on salivary amylase activity. (Demo)
Estimation of oxygen consumption by cockroach (Demo)
Detection of abnormal constituents of urine- glucose, albumin and bile. (Major)
Detection of blood groups. (Minor)
Determination of coagulation time. (Minor)
Determination of blood pressure using sphygmomanometer. (Demo)
Cardiac efficiency test. (Minor)

Histology

Study of permanent slides (Any five items) – Epithelial tissue, Muscle, Cartilage, Bone, Nervous tissue, etc.

REFERENCE BOOKS: ANIMAL PHYSIOLOGY

1. Guyton, A.C. (2015).Text Book of Medical Physiology, W.B. Saunders co.

2. Hoar, W.S.(1983). General and Comparative Physiology, Prentice Hall.

3. Prosser,C.L.(1978). Comparative Animal Physiology. W.B. Saundersco.

4. Schmidt Nielsen, K. (1994). Animal Physiology: Adaptation and Environment. Cambridge University Press

MODEL QUESTION PAPERS

First Semester B.Sc. Degree Examination
Complementary Course in Zoology
1C 01 ZLG **Diversity of Life I**

PROTISTANS & NON CHORDATES

Time 3 Hours **32 Marks**

I. **Essay Questions. Answer any TWO** 2x6=12

1. Write an essay on coral forming Cnidarians
2. Explain water vascular system in echinoderms
3. Write an account on nematode parasites
4. Explain the morphology of earth worm

II. **Short Essay Questions. Answer any TWO** 2x3=6

5. Explain polyembryony in *Fasciola*
6. Write notes on *Trichonympha*
7. Explain the salient features of *Ascon*

III. **Short Answer Questions Answer any SIX** 6x2=12

8. Write on Animal protists
9. Explain the feature of *Physalia*
10. What are the adaptations of *Schistosoma*
11. Write on pathogenicity caused by *Taenia*
12. Write on Heteronereis.
13. Explain medusa in Cnidaria
14. Explain Polymorphism in *Obelia*
15. Sexual dimorphism in *Ascaris*

IV. Multiple choice Questions. All Questions compulsory 4x0.5=2

16. Binary fission is a mode of reproduction in
    a. Amoeba b. Nereis c. Ascaris d. Obelia
17. Contractile Vacuole is a structure for
    a. Osmoregulation b. Respiration c. Coordination d. Sensation
18. The component of saliva of *Hirudinaria* used for preventing blood clotting
    a. Hirudin b. Thrombin c. Ptyalin d. Kallikrein
19. The thickened glandular non-segmented section of body in earthwork is
    a. Metamerism b. Prostomium c. Nephrostome d. Clitellum

Second Semester B.Sc. Degree Examination
Complementary Course in Zoology
2C 02 ZLG **Diversity of Life II**
Chordate Form and Function

Time : 3 hours **32 marks**

I. Essay Questions. Answer any TWO **2x6=12**

1. Describe circulatory system of shark with suitable diagram
2. Write an essay on identification of poisonous snakes.
3. Describe an essay on chordate eggs
4. Write an account of aortic arches in vertebrates

II. Short Essay Questions. Answer any TWO **2x3=6**

5. Explain flight adaptations of birds
6. Write note on urochordates and cephalochordates
7. Briefly describe chordate characters

III. Short Answer Questions. Answer any SIX
6x2=12

8. Sketch and label human egg
9. Explain Pentadactyl limb
10. Distinguish Artiodactyl and perissodactyl conditions
11. Write on features of Marsupials
12. Write on blastulation in *Branchiostoma*
13. Name and notes on embryonic membrane
14. Write on features of flightless birds
15. Write on respiratory modifications in birds

IV. Multiple Choice Questions. Answer All Questions.
4x0.5=2

16. Animals with venous heart
    a. Toad b. Shark c. Salamander d. Crocodile
17. Example flightless bird
    a. Cassowary b. Pelican c. Parrot d. Flamingo
18. Neoteny exhibited by
    a. Gorilla b. Ostrich c. Chameleon d. Salamander
19. The transition form of bird-like Dinosuar
    a. Archaeopteryx b. Diplodocus c. Allosaurus d. Oviraptor

Third Semester B.Sc. Degree Examination

Complementary Course in Zoology

3C 03 ZLG :Animal Physiology

Time : 3 hours **32 marks**

I. Essay Questions: Answer any TWO **2x6=12**

1. Describe the mechanism of carbohydrate digestion in man
2. Explain the mechanism of urine formation in man
3. Describe the mechanism of muscle contraction
4. Write an essay on the mechanism of nerve impulse transmission

II. Short Essay Questions. Answer any TWO **2x3=6**

5. Transport of CO2 as bicarbonates
6. Write note on different respiratory pigments
7. Briefly describe the roles of thyroid hormones

III. Short Essay Questions. Answer any SIX **6x2=12**

8. What are glial cells ?
9. Explain uricotelism
10. Distinguish between myogenic and neurogenic hearts
11. Write on corpus luteum
12. Give an account of compound stomach
13. What is ampulla of Lorenzini ?
14. What is ADH ? Give its role
15. What are islets of Langerhans ?

IV. Multiple Choice Questions All Questions compulsory. **4x0.5=2**

16. Hyposecretion of growth hormone results in

b. cretinism b. Tetanus c. Dwarfism d. Acromegaly

17. Excretory organs in planaria

b. Nephridia b. flame cells c. Malpighian tubules d. contractile vacuole

18. Enzyme not present in gastric juice

b. Amylase b. Lipase c. Trypsin d. Rennin

19. Which of the following is an olfactoreceptor

b. Jacobson's organ b. Ampulla of Lorenzini c. cones d. organ of corti

Fourth Semester B.Sc. Examination

Complementary Course in Zoology

4C04 ZLG Medical Zoology

Time: 3 Hrs **Max. Marks- 32**

I. **Essay Questions. Answer any TWO**. 2x6= 12

1. Write an essay on life style related diseases.

2. Describe the life cycle and pathogenicity of *Plasmodium vivax*.

3. Write briefly about causative organism, symptoms and prophylaxis of HIV and Hepatitis.

4. Write an essay on X -linked diseases.

II. **Short Essay Questions. Answer any two** **2x3= 6**

5. What are carcinogens? Give examples.

6. What are autoimmune diseases? Give examples.

7. Describe the clinical features of Down's syndrome.

III. Short Answer Questions. Answer any six. **6X2= 12**

8. What is ECG?

9. What is albinism?

10. What are the symptoms of cholera?

11. What is allergy? Give two examples.

12. What are the clinical features of Klinefelter's syndrome?

13. What is meant by aneuploidy?

14. Explain humoral immunity.

15. What is ultrasonography?

IV. **Multiple Choice Questions. Answer all.** **4x0.5= 2**

16. Which of the following is an autoimmune disease?

a) Myasthenia Gravis b) Ascariasis c) Filariasis

17. Graft rejection is the major challenge in -------.

a)Cancer therapy b)Prophylaxis of chicken pox, c)Tissue transplantation

18. Filariasis is caused by ----------.

a)*Acylostoma duodenale* b)*Wuchereria bancrofti,* c)*Entameba histolytica*

19. Which of the following is an autosomal dominant trait?

a)Myotonic Muscular Dystrophy b)Haemophilia c)Phenyl Ketonuria

First Semester B Sc Degree Examination

Complementary Course in Biological Techniques

1C01 BGT: General Laboratory Techniques

Time : 3 Hours **Max. marks: 32**

I. **Essay Questions Answer any TWO** **2x 6=12**

1. Write an essay on any two staining procedures used in histochemical studies.

2. Give an account of Gram staining and acid-fast staining techniques. Mention their use.

3. Explain the various methods of cleaning and sterilization of glassware in the laboratory.

4. Give an account of the preparation of media for culturing different types of microorganisms.

II. Short Essay Questions. Answer any TWO **2 x 3=6**

5. Describe the working of pH meter.

6. What is a buffer solution ? Mention any two standard buffers and their preparation.

7. Describe the preparation of Bouins fluid, Carnoys fluid and buffered formalin

III . Short Answer Questions. Answer any SIX **2 x 6=12**

8. Define fixation. Mention the aims of fixation.

9. Mention any two dehydrating agents.

10. What is auxochrome ? Give an example.

11. Mention any two uses of cryostat

12. Differentiate between molarity and molality.

13. How do you prepare percentage solutions in the laboratory.

14. What are neutral stains ? Give an example.

15. Distinguish between mordant and lake

IV. Multiple Choice Questions. Answer all questions 4 X 0.5=2

16.. Who discovered blood groups?

a) Thomas Cooley b) Karl Landsteiner c) Camillo Golgi d) Ernst Haeckel

17. ----------is the technique of measurement of microscopic objects

a)Microscopy b)Microtomy c) Micrometry d) Biopsy

18. Counter stain used in Gram staining is

a) Safranin b) Crystal violet c) carbol fuschin d)acetocarmine

19. The process of killing all microorganisms along with their spores is _____

a) Disinfection b) Antisepsis c) Sanitization d) Sterilization

Second Semester B Sc Degree Examination

Complementary Course In Biological Techniques

2C02 BGT: Laboratory Equipments And Techniques

Time : 3 Hours **Max. marks: 32**

I. **Essay Questions. Answer any TWO** **2x6=12**

1. Describe the optical parts of a compound microscope. Mention their functions

2. Give an account on the working mechanism of temperature sensing devices and their uses.

3. Write an essay on paper chromatography. Add a note on its applications

4. Describe the components of a desktop computer system. Add a note on applications of computer in biological laboratories

II. **Short Essay Questions. Answer any TWO** **2 x 3=6**

5. Illustrate the working principle of spectrophotometer.

6. Describe the working principle and uses of phase contrast microscope

7. Distinguish between thin layer and column chromatography.

III .**Short Answer Questions. Answer any SIX** **6 x 2=12**

8. Mention the applications of electron microscope

9. Comment on oculometer.

10. What are the factors influencing resolution of a microscope ?

11. Differentiate between thermocouples and thermostats.

12. Briefly mention the principle of centrifugation.

13. What is R_f value ? How is it calculated ?

14. What is camera lucida?

15. What is oil immersion lens? Mention its advantages.

IV. Multiple Choice Answer Questions. Answer all questions 4X0.5=2

16. Which among the following helps us in getting a three-dimensional picture of the specimen?

a) Transmission Electron Microscope b) Scanning Electron Microscope c) Compound Microscope d) Simple Microscope

17. In Thin layer chromatography, the stationary phase is made of _____ and the mobile phase is made of _____

a) Solid, liquid b) Liquid, liquid c) Liquid, gas d) Solid, gas

18. Which of the following are components of Central Processing Unit (CPU) ?

a) Arithmetic logic unit, Mouse b) Arithmetic logic unit, Control unit

c) Arithmetic logic unit, Integrated Circuits d)Control Unit, Monitor

19. Electrophoresis is not used for the separation of

a) Nucleic acids b)Proteins c)Amino acids d)Lipids

Third Semester B Sc Degree Examination

Complementary Course In Biological Techniques

3C03 BGT: Preparation of Biological Specimens

Time : 3 Hours **Max. marks: 32**

I. **Essay Questions Answer any TWO** **2x6=12**

1.Describe the method of preparation of thin and thick blood film using Leishman's stain. Mention its significance

2. Give an account of estimations of blood sugar and bilirubin. Briefly mention their clinical significance.

3. Give an account of general methods employed in museum preparation of vertebrate skeletal materials.

4. Describe the procedure for preparation of permanent slides to demonstrate the various stages of meiosis in grasshopper testis.

II. **Short Essay Questions. Answer any TWO** **2 x 3=6**

5. Describe briefly the maintenance of living organisms in Aquarium and terrarium.

6. Explain steps involved in killing and preserving a butterfly specimen.

7. Explain dermestid technique. Mention its use.

III .**ShortAnswer Question. Answer any SIX** 6x 2=12

8. What is vasculum? Mention its use.

9. Define taxidermy. Comment on its significance.

10. Mention the factors affecting zonation in marine environment.

11. Define voucher specimen

12. Mention the reference range for total bilirubin in human blood

13. What is degreasing? Mention any two degreasing agents.

14. Differentiate between eosinophil and neutrophil

15. How sponges are collected and preserved in a museum.

IV. **Multiple Choice Questions. Answer all questions** **4X0.5=2**

16. A tool entomologists use to suck small insects into a vial is called

A. an aerial net. B. a sifter. C. an aspirator.D. a berlese funnel.

17. Which of the following is a correct sequence?

a) Labeling-pressing-collection-drying-poisoning-mounting b) collection-pressing-drying- poisoning-labeling-mounting c) collection-pressing-drying-poisoning-mounting-labeling

d) collection-pressing-poisoning-drying-mounting-labeling

18.Herbarium is

a) A garden where medicinal plants are grown b) Garden where herbaceous plants are grown c) Dry garden d) Chemical to kill plants

19. Which of the following pair includes agranulocytes

a) Neutrophil and lymphocyte b) Eosinophil and monocyte c) Lymphocyte and basophil d) Lymphocyte and monocyte

Fourth Semester B Sc Degree Examination

Complementary Course in Biological Techniques

4C04 BGT: Advanced Biological Techniques

Time : 3 Hours **Max. marks: 32**

I. Essay Questions. Answer any TWO **2x6=12**

1.Describe the structure of immunoglobulin. Add a note on the different types of immunoglobulin

2. What is monoclonal antibody. How is it produced in the laboratory. Mention its applications.

3. With a neat labeled diagram explain DNA fingerprinting? Write notes on its applications in forensic science.

4. Explain the different steps involved in Polymerase Chain Reaction. Add a note on its applications

II. Short Essay Questions. Answer any TWO **2x 3=6**

5. Explain autoradiography. Comment on its significance in biology.

6. Describe the procedure involved in the isolation of DNA

7. Explain Southern blotting.

III . Short Answer Questions. Answer any SIX **6x2=12**

8. What is real time PCR.

9. Briefly mention immunoprecipitation.

10. What is AFLP.

11. Name two culture media for animal cell culture.

12. What is explant?

13. Define radioimmunoassay.

14. Define cell lines

15. What is HAT medium ?

IV. Multiple Choice Questions. Answer all questions **4X0.5=2**

16.Immunoglobulin which can cross the placenta is

a) IgA b) IgM c) IgD d) IgG

17. What is a probe?

a) Chemically synthesized DNA b) Purified DNA

c) Fragmented DNA duplex d) Either purified or synthesized single stranded DNA

18. Which of the following is a mismatch?

a) Polymerase – Taq polymerase b) Template – double stranded DNA

c) Primer – oligonucleotide d) Synthesis – 5’ to 3’ direction

19.During electrophoresis denaturation of the double stranded DNA is brought about by

a) Treatment with alkali b) Application of current c) Treatment with EtBr

d) Application of heat

First Semester B Sc Degree Examination

Complementary Course in Physiology

1C01 PLY Biological Chemistry

Time: 3 Hrs **Max. Marks- 32**

I. **Essay Questions. Answer any TWO**. **2X6= 12**

1. Describe the primary, secondary and tertiary structure of proteins.

2. Describe the factors affecting enzyme activity.

3. Classify carbohydrates giving examples.

4. Describe the role of liver in metabolism.

II. **Short Essay Questions. Answer any two** **2x3= 6**

5. Describe different models of enzyme activity.

6. Write a note on Henderson- Hasselbalch equation.

7. Explain Michaelis Menten equation.

III. **Short Answer Questions. Answer any SIX.** **6X2= 12**

8. What are zymogens?

9. What is BMR? What are the factors that affect BMR?

10. What is meant by competitive inhibition of enzyme action? Give an example.

11. Distinguish between saturated and unsaturated fats. Give example.

12. Distinguish between aldose sugars and ketose sugars. Give an example to each of them.

13. What are the biological properties of water?

14. Explain entropy in connection with living system.

15. What is BMR? What are the factors affecting it?

IV. **Multiple Choice Questions. Answer all** **4 x 0.5= 2**

16. Which of the following is an example of monosaccharide?

(a. Galactose b. Sucrose c. Lactose d. maltose)

17. Hydrolysis reactions are catalyzed by enzymes called

(a. Oxidoreductase b. Ligase c. Hydrolase d. Lyase)

18. A process by which a protein structure assumes its functional shape or conformation
a) Denaturing b. Folding c. Synthesis d. polymerisation)

19. Which of the following is a heteropolysaccharide?

a) starch b) cellulose c) chitin d) Fructose

Second Semester B Sc Degree Examination

Complementary Course in Physiology

2CO2 PLY Cell Biology

Time: 3 Hrs **Max. Marks- 32**

I**. Essay Questions Answer any two.** **2X6= 12**

1. Illustrate and explain the fluid mosaic model of plasma membrane.

2. Describe ETS and ATP formation in the mitochondria.

3. Describe semiconservative method of DNA replication.

4. Describe the process of meiosis.

II. **Short Essay Questions. Answer any two** **2 x 3= 6**

5. Describe the structure and function of microtubules.

6. Write a note on nucleolus.

7. Distinguish between prokaryotic and eukaryotic cells.

III. **Short Answer Questions. Answer any six.** **6 X 2= 12**

8. What is facilitated diffusion?

9. What are lampbrush chromosomes? What is their significance?

10. What are the functions of Golgi complex?

11. What is meant by oxidative phosphorylation?

12. Explain phagocytosis.

13. What is translation?

14. Describe the structure of flagella.

15. What is cytokinesis?

IV. **Multiple Choice Questions. Answer all.** **4x0.5= 2**

16. Carbohydrates attached to lipid and protein are usually _____.

a) polysaccharides, b) oligosaccharrides, c)monosaccharides d) Pentoses

17. Cytoskeleton is made up of .

a) Cellulosic microfibrils, b) Proteinaceous filaments, c) CaCO3 granules d) Nucleotides

18. The statement that 'all biological catalysts are proteins' is no more valid because of the discovery of

a) Ribozyme b) Lysozyme c) Enzymes d) Holoenzyme

19. DNA replication occurs in

a) S phase, b)M phase, c) G1 phase d)G_0 Phase

Third Semester B Sc Degree Examination

Complementary Course in Physiology

3C03 PLY: Human Physiology-I

Time:3hrs **Max.marks:32**

I. Essay Questions. Answer any TWO **2x6=12**

1.Describe the process of protein digestion in man

2.Wirte an essay on neuro physiological control on respiration

3.Describe the structure of heart and cardiac cycle

4.Describe the process of urine formation with special reference to counter current mechanism.

II. Short Essay Questions. Answer any TWO **2x3=6**

5.Briefly illustrate the effect of pH on oxyhaemoglobin curve

6.Describe the structure of a typical neuron

7.Describe the mechanism of cell mediated immunity

III. Short Answer Questions. Answer any SIX **6x2=12**

8.What is ASD

9.Write a brief note on dialysis

10.What are neurotransmitters

11.What is cell mediated immunity

12.What is homeostasis

13.What is leucopenia

14.What is balanced diet

15.What is pyrexia

IV. Multiple Choice Question Answer all **4x0.5=2**

16. Secretion of bile is regulated by

a) Gastrin b)Enterogastrin c)Duocrinin d)Cholecystokinin

17. The inability to breath is

a) Eupnoea b)Dyspnoea c)Apnoea d)Pneumonia

18. Which of the following is a an anti-coagulant

a)Thrombin b)Fibrinogen c)Prothrombin d)Heparin

19. Hot spot of hearing is

a)Cochlea b)Retina c)Cornea d)Organ of Corti

Fourth Semester B Sc Degree Examination

Complementary Course in Zoology

4 CO 4 PLY: Human Physiology-II

Time :3 Hours **Maximum Marks : 32**

(Give illustrations and figures wherever necessary)

I. **Essay Questions. Answer any TWO.** **2x6=12**

1. Write an essay on the electrochemical changes responsible for contraction & relaxation of muscle.

2. Write an essay on major endocrine glands, their hormones and functions.

3. Explain human menstrual cycle.

4. Explain the EM structure of a striated muscle fiber.

II. **Short Essay Questions. Answer any TWO.** **2x3=6**

Write short notes on:

5. Artificial respiration.

6. Physiological basis of ageing.

7. Drug addiction and its effects

III. **Short Answer Questions. Answer any SIX.6 x 2 = 12**

8. What are synovial joints?

9. Name any four bones of lower limb.

10. What is Rigor mortis ?

11. Suggest any four first aid for snake bite?

12. What are communicative diseases ?

13. Write any four ill effects of smoking ?

14. What is TSH?

15. What are carcinogens?

IV. **Multiple Choice Questions. Answer all.** **4x0.5=2**

16. The all-or-none response means that

a) all of the muscles in a region contract together

b) all of the muscle fibres within a muscle contract together

c) when a muscle fibre contracts, it contracts completely

d) when a muscle fibre contracts, all of its ATP is changed to ADP

17. Concentration of the urine is controlled by _____

a) MSH b) ADH c) Oxytocin d) ACTH

18. What are 2 examples of NON Communicable Diseases

a) Flu, Mono b) Crohn's disease, Strep throat c) Cancer, High blood pressure

d) Asthma, measles

19. ACTH stimulates the adrenal cortex to release a group of hormones called

a) Mineralocorticoid b) Glucocorticoid c) Endorphin d) Glucagon

GENERIC ELECTIVE COURSES

Sl. No	Sem	Course Code	NameoftheCourse	Credit	Hours/ Week	Exam	Max.Marks		
							Int	Ext	Total
1	V	5 D 01 ZLG	Wildlife Conservation and Management	2	2	2	5	20	25
2	V	5 D 02 ZLG	Apiculture	2	2	2	5	20	25
3	V	5 D 03 ZLG	Sericulture	2	2	2	5	20	25
4	V	5 D 04 ZLG	Nutrition and Dietetics	2	2	2	5	20	25
5	V	5 D 05 ZLG	First Aid	2	2	2	5	20	25

B. Sc. DEGREE PROGRAMME (Theory)
ZOOLOGY
Generic Elective Course

WILDLIFE CONSERVATION AND MANAGEMENT

CODE : 5 D 01 ZLG

Credit:2; Hours:2/week; Total Hours:36

Course outcomes

CO 1 : Develop interest in conservation of nature

CO 2 : Acquire knowledge in in wildlife conservation strategies

UNIT I. Introduction (3hrs)

Definition of wildlife History and tradition of conservation in India. Importance of conservation – Ecological, Educational, Scientific, Ethical, Commercial, Aesthetic, Recreational

UNIT 2. Threats to Wildlife (5hrs)

Factors leading to endangered status – habitat destruction (qualitative and qualitative), isolation of population and inbreeding depression, hunting, competition. Wildlife trade. Exotic species as threat to native species a) animals (Tilapia and African catfish as examples) b) plants (mention weeds like Lantana, Mikania). Extinction. Examples of some extinct species and reasons for extinction –

Cheetah, Dodo, Passenger pigeon.

UNIT 3. Conservation Methods (5 hrs)

In – situ Conservation (Protected Areas): Wildlife Sanctuaries, National parks, Biosphere Reserves. Protected areas in Kerala. Mention major forest types (Evergreen, Semi evergreen, MDF, DDF and Shoala forests). Ex-situ conservation – Zoos – captive breeding; Modern zoo concept – safari, nocturnal zoo. Gene banks

UNIT 4. Techniques for Wildlife Study (4hrs)

Study of animal evidence in the field (Animal signs) – impression of foot on soil, droppings, feeding signs, calls, scent mark, wallows, shelter. Marking and tagging of animals. Radio telemetry, Remote sensing, Wildlife photography

UNIT 5. TRIBALS AND WILDLIFE (3HRS)

Tribal groups in Kerala. Role of tribals in Wildlife conservation - Joint Forest Management

UNIT 6Wildlife policy and legislation (3 hrs)

Indian Board of Wildlife; Wildlife Protection Act1972; CITES, IUCN; Red Data Book (Criteria for treating a species as endangered); Convention on Biodiversity.

UNIT 7. Conservation projects (3 hrs)

Project Tiger, Project elephant, Gir Lion sanctuary project, Crocodile breeding project

UNIT 8. Conservation organizations (3 hrs)

UNEP, UNDP, FAO, WWF, BNHS. Mention Chipko movement and Silent Valley movement

UNIT 9. WILDLIFE MANAGEMENT (5 hrs)

Conventions related to Wetland management. Ramsar sites in India, Zoo management- Zoo layout and exhibition of animals, Captive breeding, Safari parks. Healthcare and disease management. Disease monitoring and control, surveillance of disease. Zoonosis

UNIT 10. Ecotourism (2 hrs)

Tourism and Wildlife - Importance of Tourism in Wildlife conservation

REFERENCES

Aron N H :Wlidlife Ecology; Freeman & Co.
Negi, S.S. (1993): Biodiversity and its conservation in India. Indus Publishing Co., New Delhi.
Negi, S.S. Manual for Wildlife Management in India.
Rajesh Gopal: Fundamentals of Wildlife Management; Justice Home.

B. Sc. DEGREE PROGRAMME (Theory)
ZOOLOGY
Generic Elective Course
APICULTURE
CODE : 5 D 02 ZLG
Credit:2; Hours:2/week; Total Hours:36

Course outcomes
CO 1 : Develop self-employment capabilities.

CO 2 : Acquires scientific knowledge of profitable farming.

UNIT I (8 Hrs)
Definition, Scope, Classification of bees, Rock bee, Indian bee, Little bee and Dammer bee- their identification and habits, choice of species in Apiculture. Bee colony-Distinctive features (social organization), Identification and Functions of queen, drones and workers, Structure and functions of Legs, mouth parts and sting of worker bee. Development of Honey bee-egg, larva and pupa. Food of the bee- honey and pollen-royal jelly. Artificial feeding. Behaviour of bees-dances.

UNIT II (8 Hrs)
Principles of apiculture, Arranging an apiary, position-space-direction,acquiring bees-care of newly captured colonies-handling the bees. The bee comb and its architecture-Different kinds of cells.
Different types of Modern hives (Newton, Langstroth) – Architecture. Appliances used in Apiaries.

UNIT III (8 Hrs)
Swarming-Prevention and control.Uniting stocks-Different methods Queen rearing. Requeening. Feeding methods. Apiary management. Inter-relationships of plants and bees.

UNIT IV (8 Hrs)
Honey bee products. Honey- Collection and Extraction, Preservation and storage –Physical properties,Chemical composition,nutritive value, medicinal values-honey as daliy food. Bee wax-Production , method of extraction-characteristics and uses. Bee venom-method of collection - composition of venom- its uses.

UNIT V (4 Hrs)
Enemies of bees- Mites, Greater wax moth, lesser wax moth, ants, wasps, beetles, birds and their management. Diseases of bees-adult and brood diseases- Bacterial, Fungal, Viral & Protozoan; Prevention and Control measures.

REFERENCES:
1. Bee Keeping in India – Sardar Singh- KAR,Delhi.

2. Bee keeping in South India – Cherian M.C. & Ramachandran, Govt.Press,Chennai.
3. Handbook of bee keeping – Sharma P.L. & Singh S.,Chandigarh.
4. Apiculture – J. Johnson and Jeyachandra, Marthandam, TamilNadu.

B. Sc. DEGREE PROGRAMME (Theory)
ZOOLOGY
Generic Elective Course
SERICULTURE
CODE : 5 D 03 ZLG
Credit:2; Hours:2/week; Total Hours:36

Course outcomes
CO 1 : Develop self-employment capabilities.

CO 2 : Acquires scientific knowledge of sericulture

UNIT I (2 Hrs)
Importance of sericulture, sericulture industry in India, sericulture as cottage industry, role of Central Silk Board.
UNIT II (6 Hrs)
Moriculture - Mulberry varieties - Diseases of mulberry – fungal diseases –Bacterial diseases – Viral disease –Neamatode disease - one example each - Pests of mulberry – leaf eating insect pests and borer pests - one example each.
UNIT III (9 Hrs)
Biology of silkworm. Life history of *Bombyxmori*. Morphology of larva; silk glands, spinnerets, silk proteins. Uni, bi and multivoltine breeds.Non mulberry silk worms.
UNIT IV (9 Hrs)
Rearing of silkworm: Rearing house – Rearing appliances – Rearing operation – Disinfection – Brushing – Maintenance of optimum conditions, Feeding – bed cleaning – spacing. Rearing of young ages – Chawki rearing - Rearing of late age larva: Shelf rearing. Floor rearing. Application of sampoorna. Mounting: Methods – precautions, Harvesting and sorting of cocoons.
UNIT V (8 Hrs)
Silk reeling: cocoon stifling – types, sorting, boiling and deflossing – brushing, Process of reeling: Different methods, silk waste and byproducts of silk reeling. Raw silk and marketing. Uses of silk.
UNIT VI (2 Hrs)
Diseases of silkworm. Muscardine, Pebrine, Flacherie. Prevention and control.
Pests ofsilkworm. Uzi fly, ants and rodents. Control measures.

REFERENCES:
1. Ganga, G. and I. SulochanaChetty, An introduction to Sericulture.Oxford& IBH Publishing Company Private Limited,S -155,Panchshila Park,NewDelhi.
2. Ganga,G. Comprehensive Sericulture,Volume – 2 Silkworm Rearing and Silk Realing. Oxford & IBH Publishing Company Private Limited, S -155,PanchshilaPark,New Delhi.
3. Dandin, S.B, Jayant Jayaswal and K. Giridhas, Hand Book of Sericultural Technologies, Central Silk Board, Madivala, Bangalore –68.
4. KamileAfifa. S and Masoodi M. Amin, Principles of Temperate Sericulture,Kalyani Publishers, B

– 1/1292,RajinderNagar,Ludhians.
5. Kesary, M and M.Johnson, Sericulture, Department of Zoology,N.M.Christian College, Marthandam.

B. Sc. DEGREE PROGRAMME (Theory)
ZOOLOGY
Generic Elective Course
NUTRITION AND DIETETICS
CODE : 5 D 04 ZLG
Credit:2; Hours:2/week; Total Hours:36

Course outcomes

CO 1: Acquireageneralawarenessregardingtherealsenseof health.

CO 2 : Understand the roleofbalanced diet in maintaininghealth.

Unit 1: Food and Nutrition: Basic Concepts (6)

Food, Nutrition, Health, Fitness, Primary Health Care and Nutritional Status .

Food :Functions and Constituents of food

Food Groups : Basic concepts

Digestion, Absorption,and Requirements of Carbohydrate, proteins and lipids.

Recommended Dietary allowances and RDA for Indians (ICMR 2010) and their uses in planning diets.

Balanced diet (concept and guidelines in planning balanced diets)

Unit 2: Nutrition through the Life Cycle (10):

Nutrition during Infancy (0-1years) and Preschool years (1-6 years): Infancy, preschool period (critical from Growth, development view point, nutrient requirements - Infant and Young \ Child Feeding practices, planning balanced diet for infants, preschoolers and special considerations for feeding young children.

Nutrition during Childhood and Adolescent: Growth, Development, Nutrient needs, meeting nutrient needs through planning balanced diets, packed lunches factors influencing food and nutrient needs during adolescence (peer pressure, body image, media, stress, fasting)

Nutrition during Adulthood and Old Age: Factors influencing nutrient requirements (age, gender, activity level-sedentary, moderate, heavy) Nutrient needs (RDA) and meeting requirement by planning balanced diets.

Nutrition during pregnancy and lactation: Understanding why pregnancy and lactation are critical from nutritional point of view, recommended dietary allowances and planning balanced diets. Special considerations in pregnancy-nausea, vomiting, heart burn, constipation)

Unit 3: Public Health and Nutrition: Basic Concept (6)

Human Development Index (HDI), Sustainable Developmental Goals (SDG): Basic Concepts

Malnutrition (Undernutrition / Overnutrition): Concept/definition, causes (conceptual framework by UNICEF)), consequences

Methods for assessment of nutritional status (Direct methods - Anthropometry, Biochemical, Clinical, Dietary survey: Basic concept)

Unit 4: Public Health and Nutrition Disorders (8)

Major Deficiency Disorders: (PEM in the context of underweight, stunting, wasting, SAM; Nutritional Anemia with special reference to Iron Deficiency Anemia; Vitamin A Deficiency (Exophthalmia); Iodine Deficiency Disorders; Zinc deficiency: Prevalence, Causes, Consequences and its control.

Other Nutritional Problems: Vitamin B complex deficiencies, vitamin C deficiency, Vitamin D deficiencies.

Overweight / Obesity: Definition / Classification (WHO), Causes and Consequences.

Non Communicable Diseases (Diabetes, CVD, cancer): Concept, Prevalence, Causes (Behavioural) and Consequences

Unit 5: Public Health and Nutrition(6):

Programmes and Policies)

National program for welfare of women &Children :objectives, beneficiaries, functions/components) (ICDS, Midday meals)

Programmes for welfare of Adolescent girls and Women (Rashtriya Kishore SwasthyaKaryakram (RKSK), Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (SABLA), Indira Gandhi MatritvaSahyogYogna (IGMSY)

B. Sc. DEGREE PROGRAMME (Theory)
ZOOLOGY
Generic Elective Course
FIRST AID
CODE : 5 D 05 ZLG
Credit:2; Hours:2/week; Total Hours:36

Course outcomes

CO 1: Acquire basic knowledge in first aid

CO 2 : Develop service mentality

Unit-1- 3 Hrs- Introduction

First aid- definition, importance, First aid kit- constituents and uses, responsibilities of a first aider.

Unit-2- Wounds and bleeding- 5 Hrs.

External bleeding-How to stop bleeding, Head injuries, eye injuries, dressings and bandages, Internal bleeding, personal hygeine while dealing with wounds, care of amputated digits.

Unit 3-Shocks 8 Hrs

Asphyxia and causes, Fainting, unconsciousness, low BP, diabetic comma, seizures, heart attack, drowning, treating foreign bodies, CPR.

Unit 4- Burns 4 Hrs

Burns and scalds, fire burns, electric shock, sunstroke

Unit 4- Fractures and sprains 4 Hrs.

Fractures, sprains, dislocations strains, tourniquets, splints.

Unit 5- Animal bites and allergies 5 Hrs

Insect bites, stings, snake bites, dog bites, allergic reactions

Unit 6- Poisoning 4 Hrs.

Swallowing, inhaling, touching, injecting gases, medicines, cosmetics, detergents, pesticides, petrochemicals, heavy metals, radioactive metals.

Unit 7- Transportation of the victim. 3Hrs.

One -person carry, two-persons carry, three – persons carry, Drag method, stretcher.

References:

1. Varghese S and Joseph V. Nursing foundations and first aid. 2nd Ed. Frontline publ. Hyderabad.

2. Gupta LC and Gupta A. Reference manual of first aid. Jaypee brothers (P) Ltd.

3. First aid manual. St.John ambulance. 9th Ed. Publ-British red cross.

4. www.redcross.org.

MODELQUESTIONPAPERS

V Semester BSc Degree Examinations

Generic Elective Course

5D01ZLG

WILDLIFE CONSERVATION AND MANAGEMENT

Time: 2Hours TotalMarks:20

1.Match the following: (1 Mark)

a) Corbett park – Lion

(b) Runn of Kutch – Rhino

(c) Gir forest – chinkara

(d) Kajiranga-Tiger

2. Fill in the blanks: (1 Mark)

a) Scientific name of tiger is ----------

bThe **wildlife protection act was implemented in India in the year?**

c) Number of queen in honey bee coloney is ----------

d) The name of the bees' dance when nectar can be collected in fewer than 100 metres----- ----------

II. Answer any six: (6x1=6 Marks)

1. Define zoonosis.
2. Brief on ecotorism.

3. Write note on Indian Board of Wildlife
4. Comment on Wildlife Protection Act
5. What are CITES
6. Comment on dodo
7. Write a note on red data book.
8. Write notes on sanctuary
9. Brief account on ex situ conservation

III.Answer any four: **(4x2=8 Marks)**

10. Comment on importance of wild life.
11. Explain the role of tribals in Wildlife conservation -
12. Comment on IUCN
13. What is WWF
14. Brief account onJoint Forest Management.
15. Comment on importance of National parks.
16. Give a note on invasive species
17. Give an account of insitu conservation

IV.Answer any one: **(1x4= 4 Marks)**

18. Describe various conservation projects in India?

19.Factors leading to decline of wild life

21.Write an essay on importance of wild life

V Semester BSc Degree Examinations

Generic Elective Course

5D02 ZLG APICULTURE

Time: 2Hours TotalMarks:20

1.Match the following: (1 Mark)

a). Sericin - Cocoonage

b) Stifling - Microsporidia

c) Chandrika - Killing pupae

d) Nosema - Silk gum.

2. Fill in the blanks: (1 Mark)

a) Scientific name of honey bee is----------

b) Sugar component of honey is ----------

c) Number of queen in honey bee colony is ----------

d) The name of the bees' dance when nectar can be collected in fewer than 100 metres----------

II. Answer any six: (6x1=6 Marks)

19. Define apiary.
20. Brief on medicinal value of honey.
21. Where is function of pollen basket
22. Give an account of bee venom
23. Name any four species of honey bee.

24. What are drones.

25. Comment on Uzi fly.

26. Write a note on silk glands.

27. Enlist the uses of silk.

28. Brief on brood diseases of silkworm.

III.Answer any four: (4x2=8 Marks)

29. Comment on processing of cocoons in silk technology.

30. What are the pests of silkworm and their preventive methods.

31. Comment on chandrika.

32. Illustrate the life cycle of bombyx mori.

33. Brief on different sericulture equipments.

34. Comment on importance of disinfection in silkworm rearing.

35. Give a note on the morphology of silkworm larva.

36. Give an account of silk.

IV.Answer any one: (1x4= 4 Marks)

37. Describe the diseases and enemies of honey bees.

38. Illustrate the different methods of bee keeping.

21.Write an essay on various bee keeping appliances

V Semester BSc Degree Examinations

Generic Elective Course

SERICULTURE
5D03 ZLG

Time: 2Hours TotalMarks:20

1.Match the following: (1 Mark)

a). Sericin - Cocoonage

b) Stifling - Microsporidia

c) Chandrika - Killing pupae

d) Nosema - Silk gum.

2. Fill in the blanks: (1 Mark)

a) Scientific name of muga silk worm is----------

b) Chief protein component of silk is ----------

c) Morus indica is the scientific name of a ----------

d) Number of silk worm brood per year is called ----------

II. Answer any six: (6x1=6 Marks)

39. Define moriculture.

40. Brief on sil protein.

41. Where is function of spinneret

42. Give an account of Flacherie.

43. Name any four species of silk worm.

44. What are Univoltine breeds.

45. Comment on Uzi fly.

46. Write a note on silk glands.

47. Enlist the uses of silk.

48. Brief on brood diseases of silkworm.

III.Answer any four: (4x2=8 Marks)

49. Comment on processing of cocoons in silk technology.

50. What are the pests of silkworm and their preventive methods.

51. Comment on chandrika.

52. Illustrate the life cycle of bombyx mori.

53. Brief on different sericulture equipments.

54. Comment on importance of disinfection in silkworm rearing.

55. Give a note on the morphology of silkworm larva.

56. Give an account of silk.

IV.Answer any one: (1x4= 4 Marks)

57. Describe the diseases and enemies of silkworm.

58. Explain the importance of sericulture

59. Write an essay on various steps in silkworm rearing technology.

V Semester BSc Degree Examinations

Generic Elective Course

NUTRITION ANDDIETETICS
5D04 ZLG

Time: 2Hours TotalMarks:20

1.Matchthefollowing: (1Mark)

a).Sunshine vitamin- Vitamin A

b)Diabetes mellitus Calcium

c)Watersoluble vitamin Vitamin D

d)Bone - Glucose

2. Fillinthe blanks: (1Mark)

1. ----------vitaminisneededforahealthyimmunesystem.
2. ----------isthebestsource ofOmega3oils.
3. ----------mineralisessentialfor healthyredbloodcells
4. ----------vitaminisneededtopreventbirthdefect.

II Answerany six. (6x1=6Marks)

3. Whyarevitaminsandmineralscalledmicronutrients?

4.Whyaresomevitaminsconsideredto beantioxidants?

5. WhatdoesvitaminCdoforyou?

6. Whyisfolateaveryimportantvitamin?.

7. WhatcanoccurwithvitaminAdeficiency?.

8. WhatisDiabetesmellitus?.

9. WhatisNyctolapia?.

10.Nametwoproteindeficiencydiseases.

11.Whatistherapeuticnutrition?.

12.Nametwopolyunsaturatedfattyacids.

III.Answeranyfour: (4x2=8Marks)

13.Whatisdietaryfibre?.

14.WhatDRIsrefersto?.

15.WhatisOsteoporosis?.

16.DistinguishbetweenAgmarkandISI.

17.Accountonfoodadulteration.

18.Giveanoteonhouseholdfoodpreservation.

19. Whatarethe dietmodificationsindiabetesmellitusand hypertension?

20.Giveanaccountonthe nutritionalneedsininfancy.

IV.Answeranyone: (1x4=4Marks)

21.Explaintheroleofmineralsinhealthandnutrition.

22.Brieflydiscusstherole ofdietduringillness.

23.Writeanaccountoffatsolubleandwatersoluble

vitamins.

V Semester BSc Degree Examinations

Generic Elective Course

FIRST AID

5D05ZLG

Time: 2Hours TotalMarks:20

1.Match the following: (1 Mark)

a) Heart attack – asphyxia

(b) Dog bite – Allergy

(c) Anaphylactic shock– CPR

(d) Difficulty breathing -rabies

2. Fill in the blanks: (1 Mark)

a) A burn should be immersed or placed under cold water for at least---------- minutes-

bThewildlife protection act was implemented in India in the year?

c) The equipment can assist in restoring a casualty's normal heart rhythm in a cardiac arrest is.....

d) The treatment for a casualty having an anaphylactic reaction is.....

II. Answer any six: (6x1=6 Marks)

60. Define first aid kit

61. What is the first aid treatment for a casualty with sudden chest pain?.

62. Write note on responsibilities of a first aider

63. Explain tournquets

64. What is asphyxia

65. Comment on CPR

66. Write a note on allergy.

67. What is the first aid for sprains

68. Brief account on artificial breathing

III.Answer any four: (4x2=8 Marks)

69. Explain the importance of first aid

70. Explain the first aid for fractures

71. What is the treatment for a casualty having an anaphylactic reaction?

72. What is the first aid treatment for a casualty with a nose bleed?

73. What is the cause of angina?

74. What is the initial treatment for a burn?

75. What should your first action be when treating an electrical burn?

76. .What is an open fracture?

IV.Answer any one: (1x4= 4 Marks)

77. Define first aid, Describe the first aid for dog bite and snake bite?

19.Describe the first aid for fractures and sprains?

21.Write an essay on dressing and bandages