


KANNUR UNIVERSITY

(Abstract)

M.Sc Zoology Programme -Revised Scheme, Syllabus and Model Question Papers - Core/Elective Courses under Credit Based Semester System-Affiliated Colleges -Implemented with effect from 2014 Admission - Orders issued.

ACADEMIC BRANCH

U.O No. Acad/C4/8008/2014

Dated, Civil Station (PO), 18-07-2014

- Read: 1. U.O.No.Acad/C1/11460/2013 dated 12/03/2014.
2. Minutes of the meeting of the Board of Studies in Zoology (PG) held on 24-06-2014.
3. Minutes of the meeting of the Faculty of Science held on 25-03-2014.
4. Letter dated 26-06-2014 from the Chairman, Board of Studies in Zoology (PG).

ORDER

1. The Revised Regulations for Credit Based Semester System have been implemented in this University with effect from 2014 admission vide paper read (1) above.

2. The Board of Studies in Zoology (PG), vide paper read (2)above, has finalized the Scheme, Syllabus and Model Question Papers for M.Sc Zoology under Credit Based Semester System with effect from 2014 admission.

3. As per the paper read (3) above, the meeting of Faculty of Science approved the Scheme, Syllabus and Model Question Papers for M.Sc Zoology w.e.f.2014 admission.

4. The Chairman, Board of Studies in Zoology (PG) vide paper (4) above, has forwarded the Scheme, Syllabus and Model Question Papers for M.Sc Zoology for implementation with effect from 2014 admission.

5. The Vice Chancellor after considering the matter in detail and in exercise of the powers of Academic Council conferred under section 11 (1) of Kannur University Act 1996 and all other enabling provisions read together with has accorded sanction to implement Scheme, Syllabus and Model Question Papers (Core/Elective Courses) for M.Sc Zoology Programme under Credit Based Semester System with effect from 2014 admission subject to report Academic Council.

6. The Implemented Scheme, Syllabus and Model Question Papers are appended.

7. Orders are, therefore, issued accordingly.

Sd/-
DEPUTY REGISTRAR (ACADEMIC)

For REGISTRAR

To
The Principals of Colleges offering M.Sc Zoology Programme.

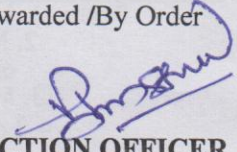
(PTO)

Copy to:

1. The Examination Branch (through PA to CE).
2. The Chairman BOS in Zoology (P G).
3. PS to VC/PA to R/PA to CE
4. DR/AR 1 (Acad).
5. SF/DF/FC.



Forwarded /By Order


SECTION OFFICER

STV
19/9/14

For more details; log on www.kannur university .ac.in



KANNUR UNIVERSITY
RESTRUCTURED CURRICULUM
AND SYLLABI

M.Sc. ZOOLOGY PROGRAMME

**(UNDER CREDIT BASED SEMESTER SYSTEM
FOR POST-GRADUATE CURRICULUM 2014)**

KUCBSS-PG-2014

FROM 2014 ADMISSION
ONWARDS

POST GRADUATE PROGRAMME IN ZOOLOGY

Introduction

The syllabi of M.Sc. programme in Zoology offered in the affiliated colleges of the university under semester system has been revised in the light of the decision of the Board of studies meeting in zoology (PG). The grading system of evaluation was introduced in Kannur University at the under graduate level during the academic year 2008-09. This was followed by the implementation of Choice Based Credit Semester System in 2009-10. In continuation to the academic reforms at the undergraduate level, **Credit Based Semester System** is being introduced at the Postgraduate level with effect from 2014-'15, restructuring the entire M.S Zoology programme.. The revised syllabi are to be effective from 2014 admission onwards. In the revised curriculum, M.Sc. Zoology programme has 11 core theory courses, 3 elective theory courses and 6 practical courses, and one dissertation/project course. The total marks for the entire course shall be 1500 and total credit for the entire course shall be 80. 20% of marks shall be allocated for internal assessment of theory and practical papers each.

While framing the courses, due meaning has been given to the thrust areas in Zoology/Life sciences such as Molecular biology, Biotechnology, Environmental biology and Biodiversity, Systematic Zoology, Microbiology etc. Topics from the C.S.I.R. NET/JRF syllabus in Life sciences has also been incorporated in various courses considering the future prospects of the students. The Elective subject of the programme is **Parasitology**. . Students are required to submit a collection of 20 specimens related to the elective subject as part of the practical course. An independent **project/ dissertation** with 3 credits form an important component of the programme in order to inculcate research aptitude among students

The scheme, detailed syllabi and pattern of question papers are presented herewith.

KANNUR UNIVERSITY
Scheme of M.Sc. Zoology Programme
(2014 Admission onwards)

M.Sc. ZOOLOGY – SCHEME OF COURSES UNDER CBSS – 2014 Onwards.

Semester	Course code	Title of Courses	Marks			Credits
			Internal	External	Total	
I	ZOO1C 01	Cell Biology and Genetics	15	60	75	4
	ZOO1C02	Biological Chemistry	15	60	75	4
	ZOO1C03	Systematic Zoology and Behavioral Science	15	60	75	4
	ZOO1C04	Microbial Science	15	60	75	4
	ZOO1 &2P 01	Cell Biology, Genetics & Molecular Biology	---	----	----	-
	ZOO1 &2P 02	Biological Chemistry, Biophysics & Biometry	---	----	----	-
	ZOO1 &2P 03	Environmental Biology& Systematic Zoology	--	---	---	-
		Total for I Semester	60	240	300	16
	II	ZOO2C 05	Molecular Biology & Molecular Evolution	15	60	75	4
ZOO2C06		Biophysics and Biometry	15	60	75	4
ZOO2C07		Environmental Biology	15	60	75	4
ZOO2C08		Immunology	15	60	75	4
ZOO1 &2P 01		Cell Biology, Genetics & Molecular Biology	10	40	50	3
ZOO1 &2P 02		Biological chemistry, Biophysics & Biometry	10	40	50	3
ZOO1 &2P 03		Environmental Biology& Systematic Zoology	10	40	50	3
ZOO2C09		Viva-voce	10	40	50	2
		Total for II Semester	100	400	500	27
III		ZOO3C 10	Animal Physiology	15	60	75	4
	ZOO3C 11	Developmental Biology and Endocrinology	15	60	75	4
	ZOO3E 01	General Parasitology and Helminthology	15	60	75	4
	ZOO 3 &4P 04	Animal Physiology	...	...	...	..
	ZOO3 &4P 05	Developmental Biology, Histology & Histochemistry	...	...	...	..
	ZOO3 &4P 06	Parasitology	...	...	...	..
	ZOO3 &4 Pr.01	Project/Dissertation	...	...	...
		Total for III Semester	45	180	225	12
IV	ZOO4C 12	Biotechnology and Bioinformatics	15	60	75	4
	ZOO4E 02	Protozoology, Medical and Veterinary Entomology	15	60	75	4
	ZOO4E 03	Physiology, Biochemistry and Genetics of parasites	15	60	75	4
	ZOO 3 &4P 04	Animal Physiology	10	40	50	3
	ZOO3 &4P 05	Developmental Biology. Histology & Histochemistry	10	40	50	3
	ZOO3 &4P 06	Parasitology	10	40	50	3
	ZOO3 &4 Pr.01	Project/Dissertation	15	60	75	3
	ZOO4 C 13	Viva-voce	5	20	25	1
		Total for IV Semester	95	380	475	25
Total I, II, III & IV Semester			300	1200	1500	80

- a. Total marks for semester – I 300
- b. Total marks for semester – II 500
- c. Total marks for semester – III 225
- d. Total marks for semester – IV 475
- e. Total marks for semester I to IV 1500

1. Project Work and Viva Voce

a) Each student shall carry out a project work in one of the broad areas of zoology in the III & IVth semester under the supervision of a teacher of the department. A student may, in certain cases be permitted to do the project work in a research organization on the recommendation of the Head of the Department /Department coordinator. In such cases, one of the teachers from the department shall act as supervisor/internal guide.

b) The candidate shall submit 2 copies of the dissertation based on the results of the project work at the end of the program.

c) Every student has to do the project work independently. No group projects are accepted. The project should be unique with respect to title, project content and project layout. No two project report of any students should be identical, in any case as this may lead to the cancellation of project report by the university.

d) The ESE of the project work shall be conducted by two external examiners. The evaluation of the project will be done at two stages.

- i. Internal evaluation (supervising teacher/s will assess the project and award internal marks)

- ii. External evaluation (by external examiners appointed by the university)

e) Pass conditions

- i. The students shall declare to pass the project report course if she/he secures minimum 40% marks (internal and external put together). In an instance of inability of obtaining a minimum of 40% marks, project work may be redone and the report may be resubmitted along with subsequent exams through parent department. There shall be no improvement chance for the marks obtained in the project report.

f) Assessment of different components of project may be taken as below

Internal (Viva) 20% of total		External (80% of Total)	
Components	% of internal marks	Components	% of external marks
Punctuality	10	Relevance of topic	5
Use of data	10	Statement of the topic	10
Scheme Organization of report	30	Methodology/reference/ bibliography	15
Viva-voce	50	Presentation of facts/ figures/language style/ diagrams etc	20
		Quality of analysis/ use of statistical tolls	15
		Findings and recommendations	10
		Viva-voce	25

g) Viva voce shall be conducted by two examiners; both of them shall be external examiners..

3. Continuous assessment

a) This assessment shall be based on predetermined transparent system involving periodic written tests, assignments, seminars and attendance in respect of theory courses and based on tests, lab skill, record/viva and attendance in respect of practical courses.

b) The percentage of marks assigned to various components for internal is as follows

Theory

	Components	% of internal marks
1)	Two test paper	40
2)	Assignments	20
3)	Seminars/Presentation of case study	20
4)	Attendance	20

Practicals

	Components	% of internal marks
1)	Two test papers	40
2)	Lab skill	20
3)	Records/viva	20
4)	Attendance	20

2. Grading system

Seven point indirect grading system

The guidelines of grading is as follows

% of marks	Grade	Interpretation	Range of grade points	Class
90 and above	O	Outstanding	9-10	First class with distinction
80 to below 90	A	Excellent	8-8.9	
70 to below 80	B	Very good	7-7.9	First class
60 to below 70	C	Good	6-6.9	
50 to below 60	D	Satisfactory	5-5.9	Second class
40 to below 50	E	Pass/adequate	4-4.9	Pass
Below 40	F	Failure	0-3.9	Fail

3. Pass requirement

Those who secure not less than 40% marks (ESE and CA put together) for the all courses of a semester shall be declared to have successfully completed the semester. The marks obtained by the candidate for CA in the first appearance shall be retained (respective of pass or fail). The candidate who fails in theory unit shall reappear for theory unit only and the marks secured by them in practical unit, if passed in practicals will be retained. A candidate who fails to secure a minimum for a pass in a course will be permitted to write the same examination along with the next batch. For the successful completion of a semester a candidate should pass all courses and secure a minimum SGPA of 4. A candidate who secures minimum marks (40%) for a pass in a course will be permitted to write the same examination along with the next

batch if he/she desires to improve his/her performance in ESE. There shall be no improvement chance for the marks obtained in the internal assessment. Improvement of a particular semester can be done only once the students shall avail the improvement chance in the succeeding year along with the subsequent batch. There shall be one improvement chance for a course.

4. Conduct of external examination

a) External examination in each semester shall be conducted after five months from the commencement of process..

b) The board of examiners will value the theory papers, conduct practical and viva-voce examination and evaluate the project work. The evaluation of the answer scripts shall be done by examiners based on well-defined scheme of valuation. These shall be done by examiners. There shall be double valuation system of answer books.. If the marks awarded by the two examiners differ by more than 10% of maximum marks, the answer books shall be valued by a third examiner. The final marks to be awarded shall be the average of the nearest two out of three awarded by the examiners. After that there shall be no provision for revaluation.. The project work shall be adjudicated by two external examiners. The practical examination, viva-voce and project evaluation will be conducted by two examiners(internal and external). The viva-voce examination will be based on the theory papers, practical papers, and project work as applicable.

c) The candidate shall be given one chance for improving the theory and practical papers of each semester by permitting him/her to appear for paper(s) along with the subsequent batch of students in accordance with the syllabus in course that time.

.

KANNUR UNIVERSITY
M.Sc. ZOOLOGY PROGRAMME
SYLLABI

SEMESTER I

ZOO1C01: Cell Biology and Genetics
(Theory 60 Hours- Credits- 4)

A Cell Biology (30 Hours)

1. **Cell Membrane and permeability:** Molecular organization; Permeability - passive permeability - passive diffusion - active transport - sodium pump - ionic transport through charged pores- transport proteins- carrier and fixed pore mechanism; Differentiation of cell membrane - microvilli- tight junction - belt and spot desmosomes - intercellular communications and gap junctions - cell coat and cell recognition. 6 Hours
2. **Synthesis, sorting and trafficking of proteins:** site of synthesis of organelle and membrane proteins - transport of secretory and membrane proteins across ER - post-translational modification in RER - Transport to mitochondria, nucleus, chloroplast and peroxisome - protein glycosylation - mechanism and regulation of vesicular transport - golgi and post golgi sorting and processing - receptor mediated endocytosis: Synthesis of membrane lipids. 8 Hours
3. **Nucleus:** Nuclear envelope- nuclear matrix – organization of chromatin- supercoiling, linking number, twist - nucleosome and high order of folding and organization of chromosome. 6 Hours
4. **Cell Cycle and Regulation:** Overview of cell cycle – Molecular mechanisms of regulating mitotic events – check points in cell cycle. 6 Hours
5. **Cell Death:** Apoptosis - necrosis – autophagy - ageing. 4 Hours

B. Genetics (30 Hours)

6. **Molecular mechanisms involved in recombination of DNA** - gene conversion - Rec-A protein and its role in recombination. 8 Hours
7. **Genetics of microorganisms:** the genetics of viruses- Bacteriophage T4 & Lamda, Genetics of Bacteria - mechanism of genetic exchange in bacteria transformation, conjugation, and transduction. 10 Hours
8. **Transposable genetic elements:** Transposable elements in bacteria transposable in eukaryotes- retroviruses and retrotransposons. 6 Hours
9. **Genetics of Cancer:** Onocogenes- tumor suppressor genes- BRCA genes- pathways to cancer. 6 Hours

References:

- Lodish et al., Molecular Cell Biology. W.H Freeman & Co.
Becker W M et al., the World of the Cell. Person.
DeRobertis E D F and DeRobertis E MF, Cell and Molecular Biology, Saunders.
Karp and Gerald, Cell and Molecular Biology. John Wiley.
Pollard Thomas D, Cell Biology. Saunders.
Standzinski George P Editor, Cell growth, differentiation and senescence.
Pxford University Press.
Alberts B, Molecular Cell Biology.
Roberts j Brooker, Genetics: Analysis and Principles. Addison Wesley Longman
Klug W S & Cumming W S, Concepts of Genetic. Prentice Hall.
Gardner and Simmon, Principles of Genetics. John wiley & Sons.
Strickberger, Genetics. Monroe w.
Bhasin M.K & Walter H, Genetics from Genes to Genome.
Stent G, Molecular Genetics. Freeman.
Burns G W & Hottins P J, The Science of Genetics. Mapwell Macmillan.
Strickberger M W, Experiments in Genetics with Drosophila. John wiley.
Hartl, David L, Genetics. Jones and Bartlett.
King William S & M R Qumming. Genetics. Prentic Hall
Waseem Ahamed. Genetics and Genomics Pearson Education.

ZOO1C02:Biological Chemistry
(Theory-60 hrs -Credits-4)

1. Biomolecules and its Cellular metabolism

1.1.Carbohydrates

- a. Classification, structure and properties
- b. Carbohydrates derivatives- sugar alcohols, sugar acids, amino sugars etc.
- c. Glycolysis, Fate of pyruvic acid (Pyruvic acid dehydrogenase), TCA cycle, Glycogenolysis, Glycogenesis, Gluconeogenesis, pentose phosphate pathway, glyoxylic acid cycle.
- d. Regulation of glucose metabolism

6 Hours

1.2.Protein

- a. Classification of amino acids, structure and properties
- b. Peptide bonds, Zwitter ions
- c. Reactions of Proteins
- d. Classification of proteins
- e. Three dimensional structure of proteins;
- f. protein folding
- g. Deamination, transamination and transmethylation
- h. Urea Cycle
- i. Metabolism of glutamic acid, phenyl alanine, methionine, tryptophan, isoleucine and histidine
- j. Inborn errors in amino acid metabolism

15 Hours

1.3.Lipids

- a) Classification, structure and properties
- b) Phospholipids, glycolipids, sphingolipids
- c) HDL and LDL
- d) Biosynthesis and oxidation of fatty acids
- e) Biosynthesis of phospholipids, sphingolipid, glycolipid
- f) Regulation of fatty acid metabolism

14 Hours

1.4.Nucleic Acid

- a) Structure of nitrogen bases, nucleosides and nucleotides
- b) Structure of DNA and RNA
- c) Biosynthesis and degradation of purines
- d) Biosynthesis and degradation of pyrimidines.

5 Hours

1.5 Enzymes

- a) IUB classification, nomenclature and specificity
 - b) Mechanism of enzyme action
 - c) Michaelis-Menten equation- derivation, double reciprocal plot, Line-Weaver-Bruke-method, Significance of K_M and V_{max} values
 - d) Factors affecting enzyme action,
 - e) Regulation of enzyme activity, enzyme inhibition, allosteric enzymes- positive and negative modulators
 - f) Vitamins as co-enzymes
- 10 Hours

2. Bioenergetics

- a) Enthalpy, entropy, free energy concept
 - b) Living body as a thermodynamic system, energy of activation, standard free energy
 - c) Energy-rich compounds- ATP, Creatine Phosphate and Pyrophosphate
- 5Hours

3. Biological oxidation

- a) Electron transport system in mitochondria, redox potential
 - b) Mechanism of oxidative phosphorylation
 - c) Chemiosmotic coupling hypothesis.
- 5Hours

References:

1. Stryer, L. (1995): Biochemistry(4th Ed), W. H. Freeman & Co., New York
2. Lehninger, A. L. (1990): Principles of Biochemistry, CBS Publishers & Distributers Pvt. Ltd.
3. Mahler, H. R. & Cordes, E. H. (1968): Basic Biological Chemistry, Harper & Row Publishers
4. Lehninger A. L., Nelson, D. L. & Cox, M. M. (1993): Principles of Biochemistry (2nd Ed.), CBS Publishers & Distributers Pvt. Ltd.
5. Donald Voet and Judith G Voet.(2011): Biochemistry (4th Ed.), John Wiley and Sons. INC.
6. Awapara, J. (1968): Introduction to Biological Chemistry, Prentice-Hall of India, New Delhi
7. Ranganatha Rao, K. (1986): Textbook of Biochemistry (3rd Ed.), Prentice-Hall of India, New Delhi
8. Cohn, E. E. & Stump, P. K. : Outlines of Biochemistry, Wiley Estern, New Delhi
9. Wilson, J. & Walker, K. (1996): Practical Biochemistry- Principles and Techniques (4th Ed.), Cambridge
10. Sadasivan, S. & Manikam, A. (1996): Biochemical methods (2nd Ed), New Age International Publishers
11. Pattabhiraman, T. N. (1998): Laboratory Manual in Biochemistry (3rd Ed.), All India Publishers and Distributers, Chennai
12. Nelson David L., 2000, Principals of Biochemistry (McMiillan)
13. Sathyanarayanan, U., 2002, Biochemistry (Books and Allied)
14. Rastogi, S. C., 2003, Biochemistry (Tata-McGraw Hill)
15. Dandekar, S. P., 2004, Medical Biochemistry (Elsevier)
16. Veerakumari, L., 2004, Biochemistry (MJP)
17. Chatterjee, M. N., 2005, Text Book of Medical Biochemistry (Jaypee)

ZOO1C03: Systemic Zoology and Behavioral Science

(Theory-60 hrs -Credits-4)

A. Systematic Zoology (30hrs)

1. Introduction

Definition and basic concepts; Systematics and Taxonomy; Historical resume; Levels of Taxonomy- alpha, beta and gamma taxonomy; importance of Taxonomy

4 Hours

2. Classification

History; Principles and Rules of classification; Functions of Classification; Kinds of Classification- Phenetic, Cladistic, Evolutionary and Hierarchical.

4 Hours

3. Species Concepts

Species concepts-Typological, Nominalistic, Biological and Evolutionary . Intraspecific Categories; Variety, Race, Cline, Subspecies.

5 Hours

4. Taxonomic Characters

Definition and Functions; Kinds of Taxonomic Characters-Morphological, Anatomical, Embryological, Ecological, Ethological, Cytological, Biochemical, Geographical and Molecular.

6 Hours

5. Taxonomic Procedure

Taxonomic Collections, Curation, Labelling, Cataloguing, Description, Identification- Methods of identification- Taxonomic key.

5 Hours

6. Zoological Nomenclature

History; International Code of Zoological Nomenclature-important Codes of Zoological Nomenclature- Nature of Scientific names; Species and infraspecific names; Genus group taxa; Synonyms and Homonyms; Authors' name in bracket; Law of Priority; Type Method and kinds of Types.

6 Hours

B. Behavioural Science(30hrs)

1. Introduction

Definition and concepts; Ethology and its relation to other schools studying Animal Behaviour

2 Hours

2. Instinctive Behaviour

Instinctive behavior; Fixed Action Pattern; Sign Stimuli and Releasers; Supernormal Stimuli.

4 Hours

3. Reflex and Complex Behaviour

Latency ; After discharge; Summation; Warm up; Fatigue; Inhibition; Feedback regulation; Orientation and Navigation in birds; Displacement Activities.

5 Hours

4. Biological Communication

Nature and Functions- Forms of signals; Costs and benefits of signaling; Types of Communications- Chemical, Visual, Auditory, Tactile and Electrical

5 Hours

5. Reproductive Behaviour

Evolution of sex and reproductive strategies; Mating system; Courtship; Sperm competition; Sexual selection; Parental care.

4 Hours

6. Genetics of Behaviour

Relationship between genes and behavior; Experimental methods demonstrating genetic basis of behavior; Relationship between genes and environment in the control of behaviour

5 Hours

7. Evolution of Behaviour

Adaptiveness of behavior; Cultural transmission of behavior; kin selection and inclusive fitness; Altruism and Reciprocal altruism.

5 Hours

References:

- Balckwelder, R. C (1967) Taxonomy- A text and reference book. John Wiley and Sons Inc., New York, London, Sydney, 698 pp.
- Dalela, R.C and R. S Sharma (1992) Animal Taxonomy. Jaiprakashnath Co., Meerut.
- Hills, D. M., Moritz, C. and Mable, B. K (eds.) (1996) Molecular Systematics, Sinauer Associates, Sunderland, MA
- Kapoor, V.C (1998) Theory and practice of Animal Taxonomy. Oxford & IBH, Publ., Co., New Delhi.
- Mayr, E., Linsley, E.G. and Usinger, R.L (1953) Methods and principles of Systematic Zoology. McGraw Hill Book Company, Inc., New York. 336 pp
- Mayr E (1969) Principles of Systematic Zoology. McGraw Hill Inc., New York
- Mayr, E and Peter D. Ashlock (1991). Principles of Systematic Zoology. McGraw-Hill
- Minelli, A. (1993) Biological Systematics. Chapman & Hall, London, 387 pp.
- Ross, H. H. (1974) Biological Systematics. Addison - Wesley Publishing Company, Inc., London, 345 pp.
- Simpson, G.C (1961) Principles of Animal Taxonomy, Oxford IBH
- Amita Sarkar 2004, Development of Animal Behaviour, discovery Publishing house.
- Bolchuis J J and Hogan J.A (1999). The development of Animal Behaviour. Blackwell Publisher.
- Boulenger, E.G 2003, An Introduction to animal behaviour, Discovery Publishing house, New Delhi.
- Goodenough, J.; McGuire B. and Robert, W. (1993) Perspectives on Animal behaviour John Wiley and Sons, Lond.
- John Alcock, (2001) animal behaviour- 7th edition. Sinauer assn. publ.
- John Alcock, 2005. Animal Behaviour.- 8th edition. Sinauer Associates, Inc. Publishers.
- Lee Alan Dugattan (2004) Principles of animal behaviour w.w. Norton & company
- Lehner, P. (1996) Handbook of Ethological methods. Cambridge Univ. press, Lond
- Manning, A. and Dawkins, M.S (1995) An Introduction to Animal Behaviour. Cambridge University Press.
- Manning, A (1967) An Introduction to Animal Behaviour. Edward Arnold pub., London
- Martin, P. and Bateson, P. (2001) Measuring Behaviour. An Introductory guide. Cambridge University Press.
- Narendran T.C.(2005). An Introduction to Taxonomy. ZSI
- Postlewait, J. H. and Hopkins, B.L. (1995) Nature of life. McGraw Hill
- Slater, P.J B (1995) An Introduction to Ethology. Cambridge Univ. Press. Lond.
- Slater. P. J. B (1999) Essentials of Animal Behaviour. Cambridge Univ. Press
- Slater, P. J. B and Halliday, T.R 1994) Behaviour and Evolution. Cambridge Univ. press. Lond.

ZOO1CO4: Microbial Science
(Theory – 60 hours - Credits-4)

A. Microbial Science

1. **History and scope of Microbiology** 4 Hours
2. **Microbial Diversity:** Place of microorganisms in the living world – criteria used in Microbial taxonomy; Classification of bacteria – past and present status – classification based on morphology, gram's staining and culture characteristics. Classification based on Bergey's manual of systematic bacteriology (details of sections not expected) Classification of viruses-classification based host, vital morphology and nucleic acid characteristics. 10 Hours
3. **Structural organization of bacteria and viruses:** Ultra structure of bacterial cell wall, cell membrane – flagella – pili – capsule and genome; Structure and architecture of bacteriophages. 8 Hours
- 4 **Bacterial culturing:** Physical and chemical methods of sterilization – growth media mixed microbial population – selection of pure culture – physical conditions of growth – growth curve – storage and transport of microbes 8 Hours
5. **Microbial toxins:** Exotoxins – endotoxin and other virulence factors 6 Hours
- 6 **Disinfectants and antibiotics:** Methods of testing antimicrobial substances – mechanism and action of important classes of disinfectants and antibiotics - drug resistance of antibiotics. 6 Hours
- 7 **Microbes and diseases:** Bacterial diseases – Streptococcal diseases – Tuberculosis Plague – Anthrax – Syphilis – Tetanus – Leprosy; Viral diseases – Chicken pox – Small pox – Rabies – AIDS 10 Hours
- 8 **Microbes and Pollution:** Major pollution problems – pathogens, microbial toxins, oxygen depletion, biodeterioration, eutrophication, hazardous transformation etc., and management of pollution problems using microorganisms. 8 Hours

References:

- Prescott, Harley and Klein, Microbiology, McGraw – Hill
Jacquelyn G Black, Microbiology: Principles and Exploration, John Wiley & Sons
Nester et al, Microbiology: A human perspective. McGraw Hill
Albert G Moat et al, Microbial physiology, John Wiley & Sons
Kathleen Park Talaro, Arthur Talaro, Foundations in Microbiology, Mc Graw Hill
Alcamo, Foundations of Microbiology, Jones and Bartlett Publishers
Cappuccino James, Microbiology: A Laboratory Manual; Pearson Education
Toratora Gerad, Berdell R Funke and Christine L Case (2011), Microbiology: An introduction(9th Ed.) .Pearson education
Edward A I, Microbiology. Tata McGraw Hill
Lim Daniel, Microbiology. Mc Graw Hill
Pelczar M J Jr, Chan E C S Krieg, Microbiology
Godkar, PB (1998), A Text book of Medical Laboratory Technology, Bhalani Publishing house, Mumbai
Ronald M. Atlas and Richard Bartha((2008). Microbial Ecology Fundamentals and Applications (4th Ed.) Pearson Education

SEMESTER II

ZOO2C05: Molecular Biology and Molecular Evolution (Theory-60 hours - Credits-4)

A - Molecular biology (45 Hours.)

- 1. Three dimensional structure and synthesis of DNA:** Structure and chemistry of double helical DNA, Semi-conservative replication – experiments of Messelson and Stall and Cairn's experiment. Replication - link between bacterial growth and DNA replication, semi-discontinuous replication of DNA, rolling circle and D-loop model, Replication apparatus- enzymes involved in DNA replication, Types of DNA- A,B,Z etc., Triplex DNA. 10 Hours
- 2. Restriction, modification and repair of DNA:** excision repair pathways- error prone repair- recombination repair- SOS system. 6 Hours
- 3. Transcription and processing of RNA:** Synthesis of mRNA in prokaryotes and eukaryotes, processing of mRNA: capping – poly A tailing and splicing, tRNA-cloverleaf and L-shaped tertiary structure - base modifications – wobbling, rRNA synthesis. 8 Hours
- 4. Translation:** Genetic code, various steps involved translation, post- translational modifications. 8 Hours
- 5. Eukaryotic genome:** C-value paradox; unique, moderately repetitive and highly repetitive DNA sequences; re-association kinetics - Cot value and complexity of genome; satellite DNA; Rot value. 5 Hours
- 6. Regulation of gene expression:** Operons - lac, tryptophan, arabinose and galactose 8 Hours

B – Molecular Evolution (15 Hours)

- 1. Molecules and origin of life:** Origin of basic molecules – origin of organized structures (coacervates, microspheres): RNA world – evolution of protein synthesis - evolution of genetic code; prokaryotes and eukaryotes- evolution of eukaryotic organelle; genetic constancy and variability – chromosomal variation, gene mutation, gene duplication; evolutionary history of haemoglobin, cytochrome C, pseudogenes, genetic polymorphism, eukaryotic clock; genetic drift and gene flow. 6 Hours
- 2. Microevolution,** macroevolution and punctuated equilibrium, anagenesis and cladogenesis. 5 Hours
- 3. The evolution of genome:** DNA alterations- genome size- gene diversification- introns- repeat sequences. 4 Hours

References:

- Benjamin Lewin, Genes XI, John Wiley
Benjamin Lewin, Gene Expression Vol1-3 John Wiley.
Watson J D et al., Molecular Biology. Scientific American Books. W.H Freeman.
Lodish H ET al., Molecular Cell biology. Scientific American Books. W H Freeman.
David Freidfelder, Molecular Biology. Narosa.
Brown T A, Genomes. Bioscientific.
Winnackeer Ernst I, From genes to Clones. Panima.
Dale J W and von Schantz, from genes Genomes. John Wiley.
Malathi. V Essewntials of Molecular Biology. Pearson Education.
Micklos D A et al, DNA Science. Cold spring Harbor.
Weaver Robert F, Molecular Biology. Viva Books.
Kreuzer Helen, Molecular Biology and Biotechnology: A Guide for Teachers.
Alber Bruce, Molecular Biology of the Cell. Garland Science.
Calladine, Horace Drew, Ben luisi, understanding DNA. Elsevier.
De Robertis, E.D.F and De Robertis E.M.F, Cell and Molecular Biology.
Dale J W and von Schantz, From genes to Genomes, John Wiley.
L H Hartwell et al., Genetics from Genes to Genomes, John Wiley.
Li W. H, Molecular Evolution, Sinauer Associate.
Strickberger M W, Evolution, Jones & Bartlett
Volpe E P, Understanding Evolution. Universal Books Stall
Edwin H McConkey, Human Genetics: The Molecular Evolution, Jones and Bartlette.
Masatoshi Nei and Sudhir kumar, Molecular Evolution and phylogenetics.
Oxford University Press.

ZOO2C06: Biophysics and Biometry
(Theory -60 hrs-Credits -4)

A. Biophysics (40 hrs)

1. Principle and applications of Biophysical methods

1. Microscopy: Fluorescence, Scanning and Transmission Electron Microscopy, Scanning tunneling Microscopy
2. Flow-cytometry
3. Chromatography : gel filtration, ion-exchange and affinity chromatography, thin layer and gas chromatography, High Performance Liquid Chromatography (HPLC)
4. Electrophoresis: PAGE, 2DE, IEF, PFGE
5. Centrifugation : gradient and differential; ultra centrifugation
6. X-ray diffraction,
7. Ramachandran Plot
8. Spectroscopy-fluorescence, UV, ORD, Visible, NMR, ESR, Atomic absorption and Plasma emission spectroscopy

16 Hours

2. Radiation Biology

1. Principles and applications of tracer techniques in biology,
2. Uses of X-rays in biomedical applications,
3. Measurement of Radioactivity- Autoradiography, liquid scintillation counter, gamma counter

6 Hours

3. Physics of photobiological system

1. Photodynamic action
2. Biophysics of photosynthesis

4 Hours

4. Biophysics of vision

- 1 Light and its attenuation of vision,
- 2 Eye as an optical instrument,
- 3 Formation of image

4 Hours

5. Biomagnetism

Generation and nature of biomagnetic fields

2 Hours

6. Bioacoustics

- 1 Physical basis of hearing- limit of intensity of sound, audible sound frequency
- 2 Physical basis of voice- infra or subsonic sounds and ultra sonic sounds
- 3 Physical organization of ear
- 4 Physical aspects of transmission of sound in the ear
- 5 Echo-location
- 6 Echocardiography,
- 7 Doppler ultra sonography
- 8 lithotripsy

8 Hours

B. Biometry (20 hrs)

1. Nature and scope of biometry and its applications in Biology

- a) Discrete and continuous variables
- b) Collection, classification and tabulation of data
- c) Frequency table
- d) Diagrammatic and graphic representation of data- bar diagram, pie diagram, histogram, frequency polygon, frequency curve.

4 Hours

2. Measures of central tendency

Arithmetic mean, median and mode

1 Hour

3. Measures of dispersion

Range, quartile deviation, mean deviation, standard deviation and Skewness

2 Hours

4. Probability theory

Basic concepts and definition of probability, relative frequency definition, probability distributions – binomial, Poisson and normal distributions and their applications

3 Hours

5. Testing of hypothesis

Level of significance, critical region, type I and type II error, Tests based on normal distribution- *t*-test, *F*-test, *Z*-transformation test and chi-square test

4 Hours

6. Correlation

Positive correlation, negative correlation, co-efficient of correlation (*r*)

2 Hours

7. Regression analysis

Types of regression analysis, Regression equation and its application in computing *X* or *Y*

2 Hours

8. Analysis of variance

ANOVA- one way and two way classifications

2 Hours

References:

1. Ackerman, E. (1962): Biophysical Sciences, Prentice-Hall, Inc
2. Kane, J.W. & Steinhein, M. M. (1978): Life Science Physics, John Wiley & Sons
3. Roy, K. N. (1996): A text book of Biophysics, New Central Book Agency, Pvt. Ltd., Calcutta
4. Thiravia Raj, S. (1995): Biophysics, Saras Publications
5. Jasra, P. K. & Raj, G. (2000): Biostatistics, Krishna Prakasan Media Pvt. Ltd.
6. Khan, I. A. & Khanum, A. (1994): Fundamentals of Biostatistics, Ukaaz Publications, Hyderabad
7. Dixon, W. J. & Massey, F. J., Jr. (1985): Introduction to Statistical Analysis (4th Ed)
8. Sokal, R. R. & Rohlf, F. J. (1969): Introduction to Biostatistics, W. H. Freeman and Co
9. Lewis, A. I. (1966): Biostatistics (2nd Ed), Reinhold Publishing Corporation
10. Snedecor, G. W. & Cochran, W. G. (1967): Statistical Methods (6th Ed), Oxford & IBH Publishing Co.
11. .Rama Krishnan, P. (2005) Biostatistics, Saras Publications
12. . Mariappan, P (2013). Biostatistics An Introduction. Pearson
13. Padmini, E (2007). Biochemical calculation and Biostatistics. Books and Allied(P) Lt

ZOO2CO7: ENVIRONMENTAL BIOLOGY

(Theory- 60hrs.,Credits-4)

1. Population Ecology

- 1.1. Population growth-Exponential growth, Sigmoid growth, Chaotic system, Catastrophic theory, Intrinsic rate of natural increase, Concept of carrying capacity.
- 1.2. Life history strategies (r and k selection)
- 1.3. Life tables and survivorship curves
- 1.4. Metapopulation dynamics 7 Hours

2. Biogeochemical Cycles

- 2.1. Anthropogenic influence on nitrogen, carbon and water cycles. 5 Hours

3. Ecological Energetics

- 3.1. Models of energy flow, Flow of energy in a forest ecosystem, Ecological modelling. 5 Hours

4. Ecosystem Studies

- 4.1. Ecology of wetlands: Importance, threats and management
- 4.2. Ecology of Coral reefs: Importance, threats and management
- 4.3. Ecology of Tropical Rainforests: Importance, threats and management. 9 Hours

5. Evolutionary Ecology

- 5.1. Definition, Defense mechanisms in plants.
- 5.2. Co-evolution: plant-animal interactions-pollination and seed dispersal, evolution of predator-prey systems. 4 Hours

6. Conservation Ecology

- 6.1. Impact of major ecosystem processes like habitat degradation, loss and fragmentation, over exploitation, species invasion and land use changes on biodiversity.
- 6.2. Restoration ecology.
- 6.3. Sustainable development.
- 6.4. Ecological footprinting. 10 Hours

7. Taxasphere and Inventorying

- 7.1. Reasons for undertaking inventorying, priority conservation area recognition.
- 7.2. Indexing of world's known species, *species 2000*.
- 7.3. Evaluation of biodiversity indices-Shannon-Weiner index, Similarity and dissimilarity indices, Association index. 8 Hours

8. Human Ecology

- 8.1. Human population growth-consequences and solutions.
- 8.2. Global environmental issues- ozone depletion and its impacts, human mediated global climate change-greenhouse effect and its impacts. 6 Hours

9. Environmental Biotechnology

- 9.1. Cleaner technologies: solid waste and pollution management
- 9.2. Bioremediation
- 9.3. Ecological impacts of genetically modified plants and other organisms. 6 Hours

References:

- Krebs, C.J (1985): Ecology (3rd Ed.), Harper & Row, New York
Ricklefe, R.E (1980): Ecology, John Wiley & sons, New York
Pianke, E.R (1985): Evolutionary Ecology (3rd Ed.), Harper & Row, New York

- Begon, K., Harper, L & Townsend, C.R (1987): individuals, Population and communities, Blackwell Scientific publishers, Oxford, London
- Riseth, G.D & Baumardner, K.D (1981): Population Biology, Van Nostrand New York.
- Pielon, E.C (1974): Population and community Ecology: Principles and Methods
- Pielon, E.C (1977): Mathematical Ecology, John Wiley & sons, New York
- Poole, R.W (1974) : An introduction to Quantitative Ecology, McGraw-Hill publishing co;. New York.
- Bhatt, S. (1997): Biodiversity, Oxford University press
- Sharma, P.D (1997): Environmental Biology, Rastogi publications
- Asthana, D.K & Asthana, M. (1998): environment- Problems and solutions, S. chand & co.
- Smith, R.L 1990: Ecology and Field Biology, Harper Collins
- Agarwal, K.C (1998): Biodiversity, Agrabotanica
- Kumar, R. (1987): Environment Pollution and health- Hazards in India, Ashish publishing House, New Delhi.
- Brewer, R. (1994) : the Science of Ecology, Saunders college Publication
- Ricklefs, R.E (1990): Ecology, W.H Freeman & Co.
- Townsend, C.R (2000): Essentials of Ecology, Blackwell Science
- Odum, E.P. 1994): Ecology and our Endangered support, Sydney- Sinauer Associate
- Bossel, Earth at a crossroads- path for a sustainable future. Cambridge University press.
- Caughley, Graeme, Sinclair and Antony (1994) wild life ecology and management, Blackwell Science, USA
- Carson, R. (1963) Silent spring, Houghton, Mifflin, Boston, USA
- Chauhan, T.S and Jodhi, K.N. (1996) applied remote sensing and photo- Interpretation, Vigyan prakash, Jodhpur
- Cunningham, P.W and Woodworth, S.B. (1999) Environmental Science. WCB/McGraw Hill
- Fred van Dyke (2003) conservation biology : foundation, concepts, Application. McGraw Hill.
- Jhanwar, M.L. and Chauhan, T.S (1998) Remote sensing and photogrammetry, Vigyan prakash, Jodhpur.
- Kormondy, E.J (1986) Concepts of Ecology. Prentice hall, New Delhi.
- Odum E.P (1971) Fundamentals of Ecology. Saunders, USA
- Mukerjee (1982) Endangered animals of India. ZSI, India
- Miller, Tyler Jr.G (2005) Living in the Environment, Principles, Connections and Solutions. Thirteenth edition, Thomson Brookes/Cole
- Manjunath D L(2007). Environmental studies. Pearson
- Negi, S.S (1993) Biodiversity and Conservation in India. Indian Publ. Co.
- Odum, E.P (1997) Ecology: A bridge between science and society. Sinauer associates Inc.
- Osborne, P. L (2000) Tropical Ecosystems and Ecological concepts. Cambridge Univ. press
- Peter, S. (2002) Ecology: Theories and Applications, Prentice Hall of India
- Quarrie J.E G. (1992) Earth summit, 1992. The Regency press, London
- Southwood. T.R.E and Henderson, P.A (2000) Ecological methods. Blackwell Science
- UNEP (1995) Global Biodiversity Assessment. Cambridge Univ. press., London.
- Wilson, E.O (1992) The diversity of life. Harvard Univ. press, USA
- Smith, T.M & Smith, R.L (2006). Element of Ecology, sixth edn., Pearson.
- Maiti, P.K & Maiti, P (2011). Biodiversity- Perception, Peril and Preservation, PHI.
- O'Riordan, L & Stoll-Kleeman, S. (2002). Biodiversity, Sustainability and Human Communities. Cambridge University Press.
- Peter, S (2002). Ecology. Theories and Applications. PHI.
- Seragg, A (1999). Environmental Biotechnology. ELBS.
- Seragelglin (1999). Biotechnology and Biosafety. World Bank, Washington.
- Wilson, E.O (1988). Biodiversity. Academic Press.

ZOO2C08: Immunology
(Theory -60 hrs-Credits -4)

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1. Historical background and scope of immunology | 1 Hour |
| 2. Overview of the immune system:
Innate immunity, Acquired immunity
Cellular and humoral immunity
Passive and active immunity | 1 Hour |
| 3. Cells and organs of immune system:
Basophils, Eosinophils, Neutrophils, B-Cells, T-cells, Natural killer cells,
Monocytes and Macrophages
Primary and secondary Lymphoid organs | 10 Hours |
| 4. Lymphocyte activation, proliferation and differentiation –
B Lymphocytes and T-lymphocytes | 4 Hours |
| 5. Phagocytosis and inflammation | 3 Hours |
| 6. Antigens (Immunogens)
Basis of specificity, epitopes, haptens | 2 Hours |
| 7. Antibodies:
Structure of a typical antibody molecule
Different classes of immunoglobulins (Ig A, IgD, IgE, IgG and IgM)
Organization and expression of Immunoglobulin genes- Primary immunoglobulin gene
Rearrangement; Immunoglobulin genes: Somatic recombination of gene segments,
Rearrangement of V, D and J gene segments, V(D)J recombinase | 6 Hours |
| 8. Major histocompatibility complex:
General organization: MHC class I and MHC class II
Antigen processing and presentation | 4 Hours |
| 9. Complement system:
Classical pathway and Lectin pathway | 4 Hours |
| 10. Cytokines | 3 Hours |
| 11. Hypersensitivity reactions:
Types I, Type II and Type III hypersensitivity
Delayed type hypersensitivity (DTH) | 5 Hours |
| 12. Autoimmunity and Autoimmune diseases | 2 Hours |
| 13. Immunodeficiency syndrome | 2 Hours |
| 14. Transplantation and graft rejection | 4 Hours |

15. Tumor immunology 2 Hours

16. Antigen – antibody interactions:

Agglutination reactions
Haemagglutininations, WIDAL test.
Precipitation reaction
ELISA, RIA, Immuno-electrophoresis 5 Hours

17. Vaccination

Different types of vaccines
Live attenuated vaccine; inactivated polypeptides as vaccines; recombinant vaccines and DNA vaccines
Route of vaccination 2 Hours

References:

- Fahim Halim Khan (2013) The Elements of Immunology. Pearson Education.
Janis Kuby (1997), Immunology, WH Freeman, New York
Joshi, K.R. and Osamo N.O. (1994), Immunology, Agro Botanical Publishers, Bikaner
Kenneth M. Murphy, Paul Trafers and Mark Walport (2007) Janeway's Immunology (Seventh Edition) Garland Science, New York
Peter Parham (2004). The Immune System (2nd Edition) Garland Science, New York
Raif Geha and Fred Rosen (2007), Case Studies in Immunology: A Clinical Companion (Fifth Edition). Garland Science, New York
Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne and Janis Kuby (2003). Immunology (Fifth Edition) WH Freeman, New York
Shetty, N (1993). Immunology. Wiley Eastern Ltd. New Delhi
Thomas J. Kindt, Barbara A. Osborne and Richard A. Goldsby (2007). Kuby Immunology (sixth Edition). WH Freeman, New York

PRACTICALS

(First and Second Semester)

ZOO 1 & 2 P 01: Cell Biology, Genetics & Molecular Biology (Credits – 3)

1. Study of meiosis in grasshopper testis squash and determination of chiasma frequency.
2. Preparation of Human karyotype from photographs of chromosome spreads- normal and abnormal.
3. Preparation of human blood smears to demonstrate drumsticks in neutrophils.
4. Induction of chromosome aberration in onion root tips by a suitable clastogenic agent and its demonstration by means of root tip squashes.
5. Cell fractionation isolation of nuclei and mitochondria from any suitable material (Rat liver).
6. Maintenance of *Drosophila melanogaster* culture and demonstration of sex linked inheritance of any suitable gene by means of crosses.
7. Gene mapping of *Drosophila melanogaster*, using text book problems.
8. Preparation and analysis of salivary gland chromosomes of *Drosophila*
9. Extraction and estimation of chromosomal DNA from animal tissues (by diphenylamine test).
10. Extraction and estimation of total RNA from any suitable material (by Orcinol test).
11. Extraction and estimation of protein from any suitable material (by Lowry test)
12. Hypo and hyper chromic effect of DNA- spectrophotometric analysis.
13. Preparation and sterilization of culture media.
14. Bacterial culture technique: Streak plates, spread plate, pour plate methods, hanging drop method.
15. Staining methods: Simple, negative and Gram staining.
16. Immunodiffusion: Detection of specific reactivity of precipitating antibody with soluble antigen.
17. ELISA

ZOO1 & 2P 02: Biological Chemistry, Biophysics & Biometry (Credits-3)

Biological Chemistry

1. Chromatographic separation and elution of amino acids
2. Colorimetric estimations of total free amino acids
3. Quantitative estimation of Protein-Biuret method
4. Estimation of total carbohydrates – Phenol sulphuric acid method
5. Colorimetric estimation of glucose – GOD- POD method
6. Lipid Soxhlet extraction
7. Colorimetric estimation of lipids
8. Colorimetric estimation of protein bound hexose

Biophysics

1. Beer-Lambert's law and its demonstration using colorimetry
2. Spectral studies of protein using UV spectrophotometer
3. Electrophoretic separation of proteins
4. Demonstration of diffusion using dialysis tubing
5. Gel filtration column chromatography
6. Adsorption column chromatography for purification of amino acids

Biometry

1. Computation of measures of central tendency and dispersion
2. Application of probability distributions
3. Application of standard tests (z-test, t-test, χ^2 test)
4. Analysis of variance
5. Regression analysis and correlation analysis
6. Calculation of mean, standard deviation and standard error using computer
7. Calculation of Coefficient of correlation using computer
8. Conduct of 't', F and χ^2 tests using computer software

**ZOO1&2PO3: Environmental biology and Systematic Zoology
(Credits-3)**

1. Identification, qualitative and quantitative estimation of plankton (marine and freshwater).
2. Estimation of BOD in pond, sea and polluted water.
3. Determination of transparency of water samples.
4. Estimation of chloride of water samples.
5. Estimation of nitrate of water samples.
6. Estimation of silicate of water samples.
7. Estimation of phosphate of water samples.
8. Estimation of primary productivity using light and dark bottle method.
9. Study of a pond ecosystem.
10. Study of intertidal sandy, muddy and rocky shores-observation of fauna and adaptations.
11. Determination of biodiversity index.
12. Study of museum specimens of ecological importance.
13. Preparation of simple dichotomous key to identify common genera of fishes.

SEMESTER III

ZOO3C10: Animal Physiology (Theory-70 hrs- Credits- 4)

1. **Nutrition:** Intracellular and extra- cellular digestion, regulation of digestion- hormonal and neuronal; absorptive areas and mechanism of absorption- absorption of monosaccharides, amino acids, lipids, vitamins and iron. 5 Hours
2. **Muscle physiology:** Proteins of contractile system; structure and physiology of vertebrate skeletal muscles, smooth muscles and cardiac muscles, twitch muscles and tonic muscles; mechanism of muscle contraction, molecular basis of muscle contraction, energetics of muscle contraction. 8 Hours
3. **Respiration:** Fundamentals of gas exchange, respiratory pigment- structure and distribution in animal kingdom, biological properties, functions, oxygen and carbon dioxide transport, respiratory mechanism in invertebrates and vertebrate, regulation of respiration. 8 Hours
4. **Body fluids and Circulation:** General plan of circulatory system, functional morphology of heart, haemopoiesis, haemodynamics, cardiac reflexes, cardiac cycle and its regulation, electrical characters of heart- normal and abnormal; lymphatic system. 8 Hours
5. **Homeostasis:** Regulation of body fluid composition in invertebrates and vertebrates- in different habitats- hyposmotic, hyperosmotic, terrestrial; renal function- ultra- filtration, absorption, secretion, plasma clearance; counter current mechanism; factors regulating homeostasis. 8 Hours
6. **Thermoregulation:** Thermal relation with the environment- Comfort zone, Normal body temperatures,(oral,skin and core),heat production and heat loss, factors affecting body temperature, lethal temperature. Temperature regulating mechanisms(hot and cold) mention the role of hypothalamus , thyroid and adrenal glands. Acclimatization 9 Hours
7. **Nervous system:** Action potential- general factors, ionic mechanism, conduction, giant nerve fibers; myelination of neurons, synapses- electrical and chemical transmissions, synaptic potential, synaptic polarity; neurotransmitter in invertebrates and vertebrates- chemical nature, classification, synthesis, transport and function, vertebrate brain- cerebral cortex, epilepsy, sleep emotion, limbic system and hypothalamus. 12 Hours
8. **Excretory system:** A brief account of different types of excretory organs . Urine formation (glomerular filtration, tubular reabsorption and tubular secretion) ; Regulation of water balance- mechanism of concentration of urine, counter current system(counter current multiplier)- renal regulation of acid base balance. Composition (normal and abnormal); characteristics of urine; physiology of micturition ; Renal clearance- definition, concept and significance. 12 Hours

References:

- Bruce M Koeppen, and Bruce A Station, 2009. Brene and Levy Physiology. (6th editin). Elseiver publishers.
- Clancy, and Mc vicar, A.J. (1995) physiology and Anatomay. Edward Arnold, London.
- Cyril A. Keel e, Eric Neil and Norman joels. Samson wrights Appled physiology. (13th Edition) Oxford University Press NewDelhi.
- David Randall, Warren burggrom, Katheleen French, 2002, Eckert Animal Physiology Physiology- Mechanisms and Adaptations. (5th dediiton). W.H Freeman and company.
- Ecker, R, Animal physiology, Mechanisms and adaptation, W.H Freeman & company.
- Gerard j tortora 2006, A brief atlas of the skelection, surface anatomy and selected medical images. John wiley and sons, Inc
- Gerard J Tortora, Bryan H Derrickson, 2009, Principles of Anatomy and Physiology, (12th edition) volumr- I John Willey and sons, INC
- Gerard J Tortora, Bryan H Derrickson, 2009, Principles of Anatomy and physiology, (12th edition) Volumr-2 john willey and sons. INC
- Gillian pocock and chistopher D Richards, 2001, Human physiology- The basis of medicine. Oxford university press.
- Guyton and hall, 2007, Text book of medical physiology. (11th edition). Elsevier publisher.
- Guyton, a.C and Hall, J.E (2001) Text Book of Medical Physiology, 10th edn. Prism Books, Pvt., ltd Harcourt Asia Ltd., India Edn.
- Hoar, W.S (1966) General and Comparative Animal physiology, prentice hall Inc, USA
- Jain A.K (2009): Text Book of Physiology (Vol . I & II), Avichal Publishing Company ,New Delhi.
- Jan kay, 2000, Introduction to animal physiology, Viva book private limited.
- Jensen, D (1976) The principles of physiology, Appleton-Century- Crofts, New York.
- K. Sembulingam, prema sembulingam, 2008 Essentials of Mdeical physiology, (4th edition) Jaypee brothers medical publishers (P) Ltd.
- Knut Schmidt- Nielson, 2007. animals physiology- Adaptation and environment. (5th edition) Cambridge university press.
- Lauralee Sherwood, Hillar kaladrof, and paul H Yancey . 2005 Animal physiology from genes to organisms, Thomson books publishers.
- Pat Willmer, Grashan stone and Ian Johnston. 2005. Environmental physiology of animals. (2nd edition) Black well publishing.
- Prosser, C.L., (1973) Comparative Animals Physiology, W. B Saunders & co.
- Prosser, C.L Environment and Metabolic Physiology, Wiley- Liss
- R.C Sobti , 2008. Animal physiology, Narosa publishing house.
- Randall,D, Burgrenn, W. and French, K (1997), Animal Physiology, W.H Freeman & Co., New York.
- Schiemdt- Neilsen, K.K (1994) Animal Physiology, Adaptation and Environment, Cambridge.
- Sperelakis, N. and Banks, R.O. eds. (1993) Physiology, Little, Brown & Co., London
- Strand, F. L (1978) Physiology: A regulatory systems Approach, 4th Ed. Mamcmillan Publishing Co., New York.
- Stuart Ira fox, 2006 Human physiology. (9th edition). Mc Graw hill higher education press.
- William S hoar, 2004. General And comparative Physiology. (3rd edition). Prentice hall and India Private Limited.
- William F. Ganong(1999): Review of Medical Physiology, Lange Medical Publications(Appleton & Lange)

ZOO3C11: Developmental Biology and Endocrinology

(Theory- 70hrs: Credits-4)

A-Developmental biology (45 hrs)

I. Basic concepts of development

1. Gametogenesis, factors influencing gametogenesis, gamete specific gene expression and genomics.
2. Role of hormones in Gametogenesis, biology of sex determination and differentiation.
3. Biochemistry and physiology of fertilization, egg-sperm interactions, role of species specific surface molecules in egg-sperm interactions, polyspermy and prevention of polyspermy.
4. Gene targeting (Knock out) experiments; gene activities in insects, amphibians and human. Transgenic animals and knock- outs.

10 Hours

II.Cleavage Blastulation and Gastrulation

5. Cleavage and role of yolk in cleavage formation chemical and cyto-physiology of cleavage, cyto-skeletal mechanism in cleavage.
6. Mid blastula transition, genomic equivalence and the cytoplasmic determinants.
7. Gastrulation and metabolic events in cells. Effects of foreign nucleus of early development. Problems of arrested gastrulation

10 Hours

III.Cell interaction

8. Primary organizer, embryonic induction, competence neural induction, regional specificity and double gradient model.
9. Molecular correlation in neural induction, Nieukoop centre default model of neurulation, inductive cascades
10. Mesodermal induction and growth factors.
11. Stem cells; embryonic stem cells, creating new cell types- basic evolutionary mystery; imprinting; mutants and transgenics in analysis of development. Potency, commitment, specification.

13 Hours

IV.Morphogenesis and Organogenesis in animals

12. Cell aggregation, differentiation, axes and pattern formation in *Drosophila*, amphibian and chick.
13. Organogenesis- vulva formation in *Caenorhabditis elegans*
14. Eye lens induction, limb development and regeneration in vertebrates, differentiation of neurons, post embryonic development- larval formation
15. Metamorphosis; environmental regulation of normal development; sex determination.

12 Hours

B-Endocrinology (25 hrs)

I Invertebrate Endocrinology

Aim and scope of endocrinology

1. Concept of Neurosecretion and Neuro-endocrine system in invertebrate groups
2. Neuro-endocrine mechanisms of moulting and growth in crustaceans
3. Hormonal control of reproduction and moulting in insects

5 Hours

II.Vertebate Endocrinology

4. General principles of hormone action
5. Concept of hormone receptors
6. Nature of hormone action, Steroid and protein hormones
7. 1st messenger, 2nd messenger concept

6 Hours

III.Hormone, Structure and Synthesis

8. Hormone structure
9. Chemical nature and gross features of hormones
10. Hormone levels in circulation and other body fluids
11. Biosynthesis of steroid hormones *de novo*
12. Bio synthesis of amino acid derivatives, small sized hormones
(eg: T4, Epinephrine, etc.)
13. Biosynthesis of simple peptide hormones: Pre- and Prohormones
14. Co-translational and post-translational modifications of hormone structure.
15. Hormonal control of growth and reproduction in vertebrates

11Hours

I

IV.Neuroendocrinology

- 16.Neuro-endocrine Integration in vertebrates
17. Abnormality in hormone secretion and its effect on development

3 Hours

References:

Scott F. Developmental Biology 7th ed/ 8th ((2006) 9th ed (2010). Gilbert Sinauer Associates, Inc

Walbot Holder. Developmental Biology Random House USA Inc in 1987

Browder. Development Biology Crashing rocks Books Punta Crashing Rocks Books Punt Gorda, FL, U.S.A

John W. Saunders. Jr. Development Biology Patterns, Problems and Principles Elsehower Stacks, USA

Mc Even. Vertebrate Embryology Tata Mc-Graw-Hill Publishing

B1 Balinsky. An Introduction to Embryology 5th edition 2004- W.B . Saund E.J.W.

Barrington, General and Comparative Endocrinology, Oxford, Clarendon Press.

P.J. Bentley, Comparative Vertebrate Endocrinology, Cambridge University Press

R.H. Williams, Textbook of Endocrinology, W.B. Saunders

C.R..Martin, Endocrine Physiology, Oxford University Press

A Gorbman et. Al. Comparative endocrinology, John Wiley & Sons

Tembhare D B. Invertebrate Endocrinology . Himalaya Publishing.

Z003E01: General Parasitology and Helminthology
(Theory 70 hrs; Credits-4)

A. General Parasitology (25 hrs)

1. Introduction to Parasitology; Parasitology and human welfare; Symbiosis and parasitism; Types of parasites and hosts; Transmission of parasites
5 Hours
2. Parasitic adaptations- morphological, physiological, biochemical and Immunological.
6 Hours
3. Ecology of parasites –Epidemiology, ecosystem and parasites; host demography; ecological terms in Parasitology. Parasitic Zoonoses – Epidemiology of parasitic zoonoses, social and economic impact of parasitic zoonoses
6 Hours
4. Behaviour and Parasitism – parasite effects benefitting parasites; counter measures of hosts; parasitism and altruism; parasitism and life history theory; parasite effects benefitting hosts
8 Hours

B. Helminthology (45hrs)

1. Introduction to parasitic helminthes – Importance of helminth parasites to human and to animal welfare.
5 Hours
2. Characters and outline classification of parasitic helminthes – Trematodes, Cestodes and Nematodes and Acanthocephala
7 Hours
3. Morphology, life cycle, pathology and prophylaxis of the following helminth parasites.

Phylum Platyhelminthes

A. Trematodes

- a) Monogenea :*Polystoma*
- b) Digenea : *Schistosoma, Fasciola Paragonimus, Clonorchis, Dicrocoelium Echinostoma*
- B. **Cestodes:** *Diphyllobothrium, Taenia, Echinococcus, Dipylidium, Hymenolepis* , *Stilesia, Moniezia*

Phylum Nematoda

Strongyloides, Ancylostoma, Haemonchus, Ascaris, Enterobius, Heterakis Wuchereria, Brugia, Loa, Dracunculus,, Trichiura, Trichinella,

Phylum Acanthocephala : *Macracanthorhynchus* 30 Hours

4. Freshwater gastropod molluscs as intermediate hosts of trematode parasites- classification of medically important gastropod molluscs; anti- snail measures.
3Hours

SEMESTER IV

ZOO4C12: Biotechnology and Bioinformatics (Theory-70 hrs- Credits-4)

A. Biotechnology (55 hrs)

- 1. Fundamentals of biotechnology:** History- emergence of Molecular Biotechnology revolution 3 Hours
- 2. Genetic engineering:** (a) Enzymes in genetic engineering- restriction enzymes, ligases, enzymes to modify the ends of DNA molecules: alkaline phosphates, polynucleotide kinase, terminal transferase, polymerases, reverse transcriptase etc.

(b) Gene cloning vectors: plasmids- pBR 322, Col E1, Ti plasmids- bacteriophages- lambda phage, M13, charon phages- cosmids – viral vectors for animal and plant cells – SV 40, Cauliflower mosaic virus; phagemids – BAC - special vectors - shuttle vectors, expression vectors, yeast artificial chromosomes, MAC etc.

(c) Gene isolation, identification and synthesis; Construction of chimeric DNA- cohesive end ligation- use of linkers- blunt end ligation; construction and screening of cDNA and genomic libraries- colony hybridization - plaque hybridization – chromosome walking. Chromosome jumping.

(d) polymerase chain reaction and gene amplification. (e) Microarray and gene expression analysis. 20 Hours
- 3. Gene transfer in animals and plants:** Gene transfer methods (transfection) direct gene transfer - Ti plasmid - electroporation - uptake by protoplast - microinjection – liposome mediated DNA delivery - Transgenic animals and plants. 8 Hours
- 4. DNA sequencing:** Maxam and Gilbert's chemical methods, Sanger's enzymatic chain termination method and automated DNA sequencing. 8 Hours
- 5. General applications:** Tissue culture; DNA finger printing; Gene therapy- somatic and germ line therapy- future prospects of gene therapy: RNAi and gene silencing: Terminator genes. 8 Hours
- 6. Biotechnology- hazards and impacts on society-** Biological risks- safety and regulatory arrangement- ethical issues- economic issues- legal issues- intellectual property rights. 8 Hours

B. Bioinformatics (15 hrs)

- 1. Bioinformatics: Introduction** – genomics – transcriptome - proteome. 4 Hours
- 2. Biological databases:** Generalized and specialized databases- premier institutes for database- nucleic acid codes used in database formats; collection and down loading of information from databases- literature search. 5 Hours
- 3. Sequence alignment and its evolutionary basis:** Simple alignment and multiple sequence alignment- searching the database for sequence similarity- search programmes with special reference to FASTA, BLAST, CLUSTAL W. Application of bioinformatics in phylogenetic analysis. 6 Hours

References:

- Brown T A, Gene Cloning and DNA Analysis Balackwell Science.
- Click B R and pasternack J J Molecular Biotechnology: principles and Applications of Reobmbinant DNA. Panima.
- James D Watson et al., Recombinant DNA: A short Course. Scientific American Books, W H Freeman & Co.
- Old R W & Primrose S B, Principles of Gene Manipulations, Black Well Science
- Winnaker E L, From Genes to Clones: Introduction to Gene Technology. VCH Publications.
- Purohit S S & Mathur S.K Biotechnology: Fundamental and Application. Agrobios.
- Eric Grace, Biotechnology Unzipped: promises and Realities. University Press.
- Fumento Michael, Biotechnology demystifying the concepts.
- Meyers Roberts A, Molecular Biology Biotechnology, John Wiley.
- Young, Computerized Data Acquisition and Analysis For Sciences. Cambridge University Press.
- Xiong, Essential Bioinformatics, Cambridge University Press.
- Marketa J Zvelebil, Understading Bioinformatics. Garland Science.
- Shhui Qing Ye, Bioinformatics: A practical Approach.
- Anna Tremontano, Introduction to Bioinformatics.
- David W Mount, Bioinformatics. CBS
- Mani K and Vijayaraj N, Bioinformatics, Kalaikathir Achchagam.
- Augen Jeff, Bioinformatics in the post genomic cra. Addison Wesley.
- Thieman, William J and Palladino Michael A. Introduction to Biotechnology. Pearson Education

Z004E02: Protozoology and Medical & Veterinary Entomology
(Theory 70 hrs; Credits-4)

A. Protozoology (35 hrs)

1. General characters and outline classification of parasitic protozoa 5 Hours
2. Morphology, life cycle, pathology and prophylaxis of the following protozoan parasites:
 - a) Phylum **Mastigophora**- *Trypanosoma, Leishmania, Chilomastix, Giardia, Histomonas, Trichomonas*
 - b) Phylum **Sarcodina** – *Entamoeba*
 - c) Phylum **Ciliophora** – *Balantidium*
 - d) Phylum **Apicomplexa** – *Eimeria, Toxoplasma, Plasmodium, Babesia, Theileria, Sarcocystis.*
 - e) Phylum **Myxozoa** – *Myxosoma cerebralis*
 - f) Phylum **Microspora** – *Nosema bombysis* 30 Hours

B Medical and Veterinary Entomology(35 hrs)

1. Introduction:- Importance of arthropods from the medical and veterinary point of view. 2 Hours
2. Outline classification of Phylum Arthropoda with reference to medical and veterinary importance. 3 Hours
3. Morphology, life cycle, pathology/ vector importance and control measures of following arthropods:

A. Insecta

- a) Diptera: *Phlebotomus, Glossina, Anopheles, Culex, Aedes, Mansonia, Tabanus, Chrysops.*
- b) Siphonaptera: *Ctenocephalides, Xenopsylla, Pules, Tunga*
- c) Phthiraptera: *Pediculus, Pthirus*, A brief account on lice of veterinary importance
- d) Hemiptera: *Cimex*, Triatomine bugs

B. Arachnida

- a) Ticks: *Argas, Rhipicephalus, Boophilus, Hamaphysalis*
- b) Mites: *Sarcoptes, Knemidokoptes, Leptotrombidium*

C. Crustacea

Lernaea, Sacculina, Caligus

- 4 **Myiasis** : Definition, types, medical and veterinary importance
- 5 Venomous, Urticating and Allergic Arthropods

30 Hours

ZOO4E03: Physiology, Biochemistry and Genetics of Parasites
(Theory: 70 hrs; Credits-4)

1. **Structure and functions of host- parasite interface in intracellular and extracellular parasites.** 2 Hours
2. **Nutrition and Metabolism:** Nutritional requirements, uptake of nutrients, digestion, biochemistry (energy metabolism: carbohydrate and energy metabolism in anaerobic protozoa, aerobic protozoa, apicomplexa and in parasitic helminthes; aminoacid and protein metabolism in parasites, energy sources and respiration, metabolic specialization and adaptations in parasites, excretory system, nitrogen excretion, water and ionic regulation. Neurotransmitters in nematodes and platyhelminthes. 18 Hours
3. **Micro- environment and the phases of parasitism:** Vertebrate alimentary canal, mammalian blood: phases of parasitism- host finding, physiological effect. 3 Hours
4. **Effects of parasites on hosts:** parasite induced modifications of the host, growth factors, effect on behavior, parasitic castration, effects of toxins, poisons and secretions, modification of the host cells produced by intracellular protozoa 8 Hours
5. **Parasites and hormones:** parasite hormones, influence of parasites on host endocrine system, importance of host hormones for parasites, therapeutic use for a better understanding of Parasites endocrine system, parasitic maturation and reproduction, cultivation of parasites in vitro with special reference to differentiation in the life cycle. 8 Hours
6. **Genetics of parasites:** Parasitic genomics. Molecular organization and gene structure in protozoa, Platyheminthes, nematodes and ticks; molecular basis of antigenic variation in African Trypanosomes and malaria ,the kinetoplast and knetoplast DNA (kDNA), gene expression and regulation in parasites- telomeric gene expression, discontinuous transcription of mRNA, RNA processing in parasitic organism: trans-splicing and RNAediting in kinetoplastid parasites, transfection systems in kinetoplastid flaellates, homologous gene recombination, genetic exchange in malarial parasites and trypanosomes; chromosome and gene exchange in malarial parasites and trypanosomes; transcription–unusual modes of transcription in trypanosomes and in nematodes; chromosome and gene mapping in parasites 20 Hours
7. **Molecular diagnosis and taxonomy:** Diagnosis- role of rDNA technology in parasitic diagnosis, taxonomic and systematic relationships. 5 Hours
8. **Drug resistance in parasites and Medical implications of Molecular parasitology** 6 Hours

PRACTICALS

(Third and Fourth Semester)

ZOO 3 & 4 P 04: Animal Physiology (Credits – 3)

1. Determination of effect of P^H substrate concentration, Temperature on salivary amylase activity
2. Detection of digestive enzymes in the hepatopancreas of crabs
3. Detection of digestive enzymes in the vertebrate pancreas fibrinogen
5. Demonstration of osmotic haemolysis
6. Determination of vertebrate haemoglobin using colorimetry
7. Determination of blood pressure and pulse rate
8. Enumeration of RBC of human blood
9. Total and Differential count of WBC
10. Determination of chloride regulation of esturine crab.
11. Estimation of the rate of oxygen consumption of a Fish
12. Demonstration of cell forms from invertebrate blood smear preparation
13. Determination of blood pressure and pulse rate
14. Demonstration of buffering capacity of body fluids
15. Effect of Osmotic stress on the rate of respiration

ZOO 3 & 4 P 05: Developmental Biology, Histology and Histochemistry

(Credits – 3)

Developmental Biology

1. Induced ovulation and fertilization in frog
2. Hormonal control of amphibian development –effect of thyroxin/iodine
3. Regeneration studies in frog tadpole
4. Vital staining of chick embryo – window method
5. Preparation of permanent stained whole mounts of chick embryo
6. Preparation and study of permanent stained whole mounts of larval forms
7. Ovarian index under eyestalk ablation of a crustacean
8. Total sperm count of crab using haemocytometer
9. Experimental analysis of insect development of *Drosophila*, Housefly.

Histology and Histochemisty

10. Study of prepared permanent slides of mammalian tissue sections
11. Preparation of microscopic slides of stained sections of tissues(such as liver , kidney, lung, intestine, pancreas, testis, ovary etc.)
12. Histochemical staining for carbohydrates, proteins and DNA

ZOO 3 & 4 P 06: Parasitology
(Credits – 3)

1. Preparation and uses of blood and tissue impression smears
2. Collection and preservation of protozoans, helminthes and arthropods
3. Collection and examination of faeces of human and domestic animals for the presence of immature stages (eggs, cysts and larvae) of parasites
4. Collection, preservation and identification of snail hosts in local freshwater bodies
5. Collection and study of larval parasites from snails, fish and insect larva
6. Study of prepared permanent slides of parasites and vectors
7. Preparation of whole mounts of parasites and vectors
8. Preparation of dichotomous key for the identification of trematodes/ cestodes/ insects of medical and veterinary importance
9. Survey of appropriate hosts (vertebrates and non-chordates) for helminth, protozoan, insect and acarine parasites.
10. Students are required to submit a collection of minimum of 20 specimens/whole mounts of parasites, intermediate hosts and arthropods of medical and veterinary importance.

References of Elective Courses:

- Melhorn, H (Ed) (1988): Parasitology in Focus- Facts and Trends, Springer_ Veriag, Berlin.
- Melhorn, H(ed) 2008- Encyclopedia of Parasitology vol 112 Springer
- Tranger, William (1988): Living together- The Biology of Animal Parasitism, Plenum Publishing Corporation, New York.
- Cox, F.E.G (Ed) (1993): Modern parasitology _A text book of parasitology, Blackwell Scientific Publication, London
- Brown, H.W. & Neve, F. A. (1994): basic Clinical parasitology (6th ED) Appleton and lange, Norwalk, Connecticut
- Cheng, T.C (1986): General parasitology, Academic Press, college Division, New York
- Noble, E.R & Noble, G.A (1982): parasitology, Lea & FEbiger, Philadelphia
- Solusby, E.J.L. (1982): Helminth, Arthropods and Protozoa of Domestic Animals, ELBS
- Solusby, G.D & Roberts, L.S (1989): Foundations of Parasitology, Time Mirror/Mosby, St.Louis
- Strickland. G.T (1991): Hunter's Tropical Medicine (7th Ed.) W.B Saunders Company, Philadelphia
- Kreier, J.D (Ed) (1997): Parasitic Protozoans (Vol. 1 to 4), Academic Press, New York
- Harwood, R.F & James, M.T (1979): Entomology in Human and Animal health, The Macmillan & Co. New york
- Kettle, D.S (1990): Medical and Veterinary Entomology, CAB International, U.K.
- Smith, J.D (1985): Introduction to Animal Parasites, Blackie, Glasgow
- Smyth, J.D. & Halton, D.W. (1983): The Physiology of Trematodes, Cambridge University Press, England
- Smith. J.D (1961): The Physiology of Cestodes, Freeman, San Francisco, California
- Parija, S.Ch (1990): Review of Parasitic Zoonoses, A.I.T.B.S. Publishers, Delhi
- Pathak, K.M.L (1987): Parasitic zoonoses, Agro Botanical Publisher, India
- Chandler, A.C & Read, C.A (1961): Introduction to Parasitology, John Wiley and Sons, Inc, New York
- Chatterjee, K.D (1981): Parasitology, Chatterjee Medical Publisher, India
- Baker, J.K (1959): Parasitic Protozoa, Hutchinson & Co. London
- Kanney, C.R (Ed) (1976): Ecological Aspects of Parasitology, John Wiley and Sons, Inc, New York.
- Chatterjee, K.D (1981): parasitology, Chatterjee Medical Publisher, India
- Baker, J.K (1959): parasitic Protozoa, Hutchinson & Co. London
- Kanney, C.R (Ed) (1976): Ecological Aspects of parasitology, North Holland Publishing Co. Amsterdam
- Ginetsinskaya, T.A (1988): Trematodes- Their Life Cycle, Biology and Evolution, Amerind Publishing Co. New Delhi
- World Health Organisation (1993): tropical Diseases – Research Progress 1991 and 1992 W.H.O. Geneva
- World Health Organization (1992): Lymphatic Filariasis- The Disease and its control, W.H.O Technical Report Series 821, W.H.O
- Fried, B. & Gryszk, T.K (Eds) (1997): Advances in Trematode Biology, CRC Press, Inc.
- Nama, H.S (1990): Cestode Parasites of India mammals, Scientific Publisher, Thodhpur
- Hyde, J.E (1990): Molecular parasitology, Milton Keynes, Open University Press
- Wall, R. & Sheare, D. (1997): Veterinary Entomology, Chapman & Hall
- Service, M.W. (2000): Medical Entomology for Students, Cambridge University Press

- Marr, J (1995): Biochemistry and Molecular Biology of Parasites
- Marr, J.J, Nilsen, T.W and Komuniecki, R.W (2003): Molecular Medical Parasitology. Academic Press
- Krier, J (1995): parasitic Protozoa (vol. 9 & 10), Academic Press
- Chowdhury, N. & Tada, I (Eds) (1996): helminthology, Narosa Publishers
- Lane, R.P & Crosskey, R.W (Eds) (1993): medical Insects and Arachnids, Chapman & hall
- Walker, A (1994): Arthropods of Human and Domestic Animals. A Guide to Preliminary identification, Chapman & Hall
- Bogitsch, B.J & Cheng, T.,C (1999): Human parasitology, McGraw/ Hall- W.C. Brown
- Yamaguti, S. (1963): Parasitic Copepoda and Brachiura of fishes, Interscience New York
- Yamagui A. (1971): synopsis of Digenetic Trematodes of Vertebrates (vol. 1 & @) Keigaku Tokyo
- Mathews, B.E (1998): An Introduction to Parasitology, Academic Press
- Waklin. D. (1996): Immunity to parasitology, Academic press
- Marquardt, W.C., Demarce, r.S. & Grieve, R.B (2000): Parasitology and Vertebrate Biology Harcourt Academic press
- Fleck, s.L & Moody, A.H. (1988): Diagnostic Techniques in Medical parasitology, ELBS Zoological, ZSI, Culcutta
- Agricultural Development and Advisory Service: manual of Veterinary Parasitological Laboratory Techniques, London
- Gillespie S.H & Hawkey, P.N (1995): medical parasitology- A Practical Approach, Oxford University press< new York
- Mayer, C.M & Benner, L.R : Laboratory Manual of Parasitology
- Pearse, A.C.E (1968): Histochemistry- Theoretical and applies, JCA, Churchill, e.E, London
- Gray, P. (1973): Encyclopedia of Microscopy and Microtechnique, Can Nostrand Reinhart
- Humason, G.L (1978): Animal Tissue Techniques (2nd Ed.), W.H Freeman & Company, San Fransisco
- Clark, G. (1981): Staining Procedure (4th Ed) Biological Stain Commission, Williams, and Wilkins, Baltimore
- Roberts. L.S and J.Janovy (2006): Foundations of Parasitology (MsGraw Hill)
- Bush, A.O et.al. (2001): Parasitism – The diversity and ecology of Animal Parasites
- Gennard, D.E. (2007) Forensic Entomology- An Introduction. John Wiley.

SEMESTER I

KANNUR UNIVERSITY

M.Sc. Zoology Programme (2014 Admission onwards)

Pattern of Question Papers

1.ZOO1C01: Cell Biology and Genetics

Time: 3 Hrs.

Maximum: 60Marks

Part. A. Cell biology

1. Answer any ONE out of two questions - 1x 12 = 12 Marks
2. Answer any ONE out of two questions - 1x 8 = 8 Marks
3. Answer any TWO out of three questions - 2x 5 = 10 Marks

Part B. Genetics

1. Answer any ONE out of two questions - 1x 12 = 12 Marks
2. Answer any ONE out of two questions - 1 x 8 = 8 Marks
3. Answer any TWO out of three questions - 2 x 5 = 10 Marks

ZOO1C01: Cell Biology and Genetics (Part A +Part B)

Time : 3 Hours

Maximum 60 Marks

1. Answer any TWO out of Four questions - 2 x 12 = 24 Marks
2. Answer any TWO out of Four questions - 2 x 8 = 16 Marks
3. Answer any FOUR out of six questions - 4 x 5 = 20 Marks

M.Sc. (First Semester) Zoology
(2014 Admission onwards)

Model Question Paper

ZOO1C01: Cell Biology and Genetics

Time: 3 Hours

Maximum: 60 Marks

Part. A- Cell Biology

I. Answer any ONE of the following

1. Give a detailed account on synthesis, transport and post translational modification of organelle and membrane protein.
2. With suitable diagram, explain the organization and architecture of chromatin and chromosome. (1x12= 12Marks)

II. Answer any ONE of the following

3. Explain the mechanism of active transport, citing examples.
4. Give an account on the mechanism involved cell cycle regulation. (1x8 = 8 Marks)

III. Write short notes on any two of the following

5. Apoptosis
6. Modifications of cell membrane
7. Structure on nuclear pore (2x5 = 10 Marks)

Part- B - Inheritance Science

IV Answer any one of the following

8. Explain the different mechanisms of genetic transfer in bacteria
9. Give a detailed account on the molecular mechanisms involved in recombination of DNA (1X12 = 12 Marks)

V. Answer any one of the following

10. Discuss the genetic basis of cancer.
11. Give an account on transposable elements in bacteria (1 x 8 = 8 Marks)

VI. Write short notes on any two of the following

12. BRCA genes
13. Retroviruses
14. Oncogenes (2 x 5 = 10 Marks)

2 ZOO1C02 :Biological Chemistry

Time : 3 Hours

Maximum 60 Marks

- | | |
|-----------------------------------------|---------------------|
| 1. Answer any TWO out of Four questions | - 2 x 12 = 24 Marks |
| 2. Answer any TWO out of Four questions | - 2 x 8 = 16 Marks |
| 3. Answer any FOUR out of six questions | - 4 x 5 = 20 Marks |

**M. Sc.(First Semester)Zoology
(2014 Admission onwards)**

Model Question Paper

ZOO1C02 :Biological Chemistry

Time: 3 Hours

Maximum: 60Marks

I. Answer any TWO of the following:

1. Describe the stepwise reaction involved in purine metabolism.
2. Describe the fatty acid oxidation with suitable example.
3. Explain the biosynthesis of phospholipids
4. Give an account of factors affecting enzyme catalysed reactions.

(2×12 =24 Marks)

II. Answer any TWO of the following:

- 5 Explain the hormonal regulation of glycogen metabolism.
- 6 Comment on the quaternary structure of proteins with suitable examples.
- 7 Discuss vitamins as co-enzymes
- 8 Give an account of methionine metabolism.

(2×8=16 Marks)

III. Answer any FOUR of the following:

- 9 Carbohydrate derivatives
- 10 Chemiosmotic coupling hypothesis
- 11 Michaelis-Menten Equation
- 12 HDL and LDL
- 13 Urea cycle
- 14 Standard free energy

(4×5=20 Marks)

3. ZOO1C03: Systemic Zoology and Behaviour Science

Time 3hrs

Maximum 60 Marks

Part. A. Systemic Zoology

1. Answer any ONE out of two questions - 1x 12 = 12 Marks
2. Answer any ONE out of two questions - 1x 8 = 8 Marks
3. Answer any TWO out of three questions - 2x 5 = 10 Marks

Part B. Behaviour Science

1. Answer any ONE out of two questions - 1x 12 = 12 Marks
2. Answer any ONE out of two questions - 1 x 8 = 8 Marks
3. Answer any TWO out of three questions - 2 x 5 = 10 Marks

ZOO1C03: Systemic Zoology and Behaviour Science

Time : 3 Hours (Part A +Part B)

Maximum 60 Marks

1. Answer any TWO out of four questions - 2 x 12 = 24 Marks
2. Answer any TWO out of four questions - 2 x 8 = 16 Marks
3. Answer any FOUR out of six questions - 4 x 5 = 20 Marks

M.Sc. (First Semester) Zoology
(2014 Admission onwards)
Model Question Paper

ZOO1CO3: Systematic Zoology and Behavioural Science

Time: 3 hrs

Maximum: 60 Marks

Part A – Systematic Zoology

I. Answer any ONE of the following

1. Explain various kinds of taxonomic characters
2. Give a critical account on the various taxonomic procedure

(1 x 12 = 12Marks)

II Answer any ONE of the following

3. Explain different types of species concept
4. Write an account on the importance of taxonomy

(1 x 8 = 8 Marks)

III Answer any TWO of the following:

5. Type method
6. Molecular taxonomy
7. Intraspecific categories

(2x 5 = 10Marks)

Part B -Behavioural Science

IV Answer any ONE of the following

8. Explain the methods of communication systems in animals
9. Comment on the various strategies used by birds in navigation

(1x12 = 12Marks)

V. Answer any ONE of the following

10. Write briefly on the genetics of behavior
11. Give a brief account on the reproductive behavior of animals

(1 x 8 = 8Marks)

VI. Answer any TWO of the following:

12. Cultural transmission of behaviour
13. Sex stimuli and releasers
14. Displacement activities

(2x 5 = 10Marks)

4. ZOO1C04: Microbial Science

Time : 3 Hours

Maximum 60 Marks

- | | |
|-----------------------------------------|---------------------|
| 1. Answer any TWO out of Four questions | - 2 x 12 = 24 Marks |
| 2. Answer any TWO out of Four questions | - 2 x 8 = 16 Marks |
| 3. Answer any FOUR out of six questions | - 4 x 5 = 20 Marks |

M.Sc. (First Semester) Zoology (2014 Admission onwards)

Model Question Paper

ZOO1C04: Microbial Science

Time: 3 Hours

Maximum: 60 Marks

I. Answer any TWO of the following

1. Discuss the criteria involved in the classification of microorganisms.
2. Give a detailed account on the structural organization of bacteria.
3. Write the causative agent, symptoms and prophylaxis of Anthrax and leprosy.
4. Write an essay on various methods of sterilization of microorganisms. (2x12 = 24 Marks)

II. Answer any TWO of the following

5. Give an account on management of pollution problems using microorganisms.
6. Write short essay on microbial toxins.
7. Explain the basis of viral classification
8. Give an account on various types and mode of action of antibiotics.

(2 x 8 = 16 Marks)

III. Write short notes on any FOUR of the following

9. Chicken pox
10. Microbial disinfectants
11. Gram's staining
12. Bacterial growth curve
13. AIDS
14. Transport of microbes

(4 x 5 = 20 Marks)

SEMESTER II

5, ZOO2C05: Molecular Biology & Molecular Evolution

Time: 3 Hours

Maximum 60 Marks

1. Answer any TWO out of two questions - 2 x 12 = 24 Marks
2. Answer any TWO out of two questions - 2 x 8 = 16 Marks
3. Answer any FOUR out of six questions - 4 x 5 = 20 Marks

**M.Sc. (Second Semester) Zoology
(2014 Admission onwards)**

Model Question Paper

ZOO2C05: Molecular Biology and Molecular Evolution

Time: 3 Hours

Maximum: 60 Marks

I. Answer any TWO of the following

1. Discuss on the enzymology and the steps involved in the faithful replication of DNA
 2. Explain the different steps involved in the translation of mRNA.
 3. Define operon. Describe lac operon of *E.coli* explaining both negative and positive control mechanisms operating on it.
 4. Explain the various mechanisms involves in the repair of DNA
- (2 x 12 = 24 Marks)

II. Answer any TWO of the following

5. Give an account on the various steps involved in the processing of mRNA
 6. Explain re-association kinetics and various kinetic classes of eukaryotic DNA.
 7. Explain the origin and formation of macromolecules leading to the development of prokaryotic cell.
 8. Narrate the evolutionary history of haemoglobin and cytochrome C.
- (2 x 8 = 16 Marks)

III. Write short notes on any FOUR of the following

9. Triplex DNA
10. Z DNA
11. tRNA
12. Role of introns in the evolution of genome.
13. Genetic drift.
14. C-value paradox

(4 x 5 = 20 Marks)

6. ZOO2C06 – Biophysics and Biometry

Part A. Biophysics

1. Answer any TWO out of four questions - 2x 12 = 24 Marks
2. Answer any ONE out of two questions - 1x 8 = 8 Marks
3. Answer any TWO out of three questions - 2x 5 = 10 Marks

Part B. Biophysics

1. Answer any ONE out of two questions - 1 x 8 = 8 Marks
2. Answer any TWO out of three questions - 2 x 5 = 10 Marks

ZOO2C06 – Biophysics and Biometry (Part A +Part B)

Time : 3 Hours

Maximum 60 Marks

1. Answer any TWO out of four questions - 2 x 12 = 24 Marks
2. Answer any TWO out of four questions - 2 x 8 = 16 Marks
3. Answer any FOUR out of six questions - 4 x 5 = 20 Marks

M.Sc. (Second Semester) Zoology
(2014 Admission onwards)

Model Question Paper

ZOO2C06 – Biophysics and Biometry

Time: 3 Hours

Maximum: 60Marks

Part- A. Biophysics

I. Answer any TWO of the following

1. Define half life of isotopes. Give an account of source of ionizing radiation and use of X- ray in biomedical application
 2. Explain the physical organization of ear and the physical aspects of hearing
 - 3 Describe the principle, method and application of scanning electron microscopy
 4. Discuss Principle and application of tracer techniques in biological fields.
- (2×12= 24Marks)

II. Answer any ONE of the following:

5. Give a critical account of eye as an optical instrument
 6. Comment on biophysics of photosynthesis
- (1×8= 8 Marks)

III. Write briefly on any TWO of the following:

8. Biomagnetism
 9. NMR
 10. Ultracentrifugation
- (2×5= 10Marks)

Part – B. Biometry

IV. Answer any ONE of the following:

11. Explain binomial, Poisson and normal distribution. Add a note on their applications in Biology.
12. a) Define correlation. Explain briefly the concept of positive and negative correlation with examples
b) The following data corresponds to the number of species(Y) and dissolved oxygen ml/g(X) calculate correlation coefficient between Y and X

X	12	10	9	7	6	7	6	5
Y	5.2	4.7	4.5	3.6	3.4	3.1	2.7	1.8

(1×8= 8 Marks)

V. Answer any TWO of the following

1. Chi-square test and its applications
 2. Probability
 3. ANOVA
- (2×5 =10Marks)

7. ZOO2C07 – Environmental Biology

Time : 3 Hours

Maximum 60 Marks

1. Answer any TWO out of four questions - 2 x 12 = 24 Marks
2. Answer any TWO out off our questions - 2 x 8 = 16 Marks
3. Answer any FOUR out of six questions - 4 x 5 = 20 Marks

**M.Sc. (Second Semester) Zoology
(2014 Admission onwards)**

Model Question Paper

ZOO2C07 – Environmental Biology

Time:3hrs.

Maximum: 60 Marrks

I. Answer any TWO of the following:

- 1.Explain the importance of wetland ecosystems. What are the threats encountered by these ecosystems. Suggest management strategies.
- 2.Explain the various ecosystem processes which adversely affect biodiversity.
- 3.Describe the various aspects of evolutionary ecology.
- 4.Explain how biotechnology can be effectively applied to achieve a clean environment.
(2X12=24marks)

II. Answer any TWO of the following.

- 5.Explain the various biodiversity indices.
- 6.Comment on global climate change.
- 7.Explain ecological foot printing.
- 8.Comment on the various aspects of population growth.
(2X8=16 marks)

III. Answer any FOUR of the following

:

- 9.What is ecological modelling?
- 10.Explain the concept of metapopulation.
- 11.Briefly comment on the human population growth trend.
- 12.Explain the ecological importance of coral reefs.
- 13.What do you mean by priority conservation area recognition?
- 14.Explain the procedures involved in environmental impact assessment.
(4X5=20marks)

8. ZOO2C08- Immunology

Time : 3 Hours

Maximum 60 Marks

1. Answer any TWO out of four questions - 2 x 12 = 24 Marks
2. Answer any TWO out of four questions - 2 x 8 = 16 Marks
3. Answer any FOUR out of six questions - 4 x 5 = 20 Marks

**M.Sc. (Second Semester) Zoology
(2014 Admission onwards)**

Model Question Paper

ZOO2C08- Immunology

Time: 3 Hours

Maximum: 60 Marks

I. Answer any TWO of the following

1. Describe classical complement pathway. What is MAC?
2. Write an essay on gene rearrangement of antibody diversity.
3. Write an essay on different types of autoimmune diseases
4. Describe the T cell activation and proliferation and their control

(2x12= 24 Marks)

II. Answer any TWO of the following

5. Write an account on attenuated whole organisms and purified macromolecules as vaccines.
6. Explain different modes of active immunization.
7. Give an account on primary and secondary lymphoid organs and their role in immunity
8. Write an essay on immunological basis of graft rejection

(2x 8= 16Marks)

III Answer any FOUR of the following

9. B lymphocyte
10. ELISA
11. Epitope
12. IgE
13. Interferon
14. Phagocytosis

(4x 5= 20 Marks)

SEMESTER III

9. ZOO3C10: Animal Physiology

Time : 3 Hours

Maximum 60 Marks

- | | |
|-----------------------------------------|---------------------|
| 1. Answer any TWO out of four questions | - 2 x 12 = 24 Marks |
| 2. Answer any TWO out of four questions | - 2 x 8 = 16 Marks |
| 3. Answer any FOUR out of six questions | - 4 x 5 = 20 Marks |

**M.Sc. (Third Semester) Zoology
(2014 Admission onwards)
Model question Paper**

ZOO3C10: Animal Physiology

Time: 3 Hrs.

Maximum 60 Marks

I. Answer any TWO of the following

- 1 Describe the role of blood in O₂ and CO₂ transport
- 2 Give an account of the molecular basis of muscle contraction.
- 3 Give an account of urine formation and the physiology of micturition.
- 4 Write explanatory notes on generation of action potential in a nerve cell.

(2x12=24 Marks)

II Answer any TWO of the following:

- 5 Give an account of the composition and the characteristics of urine.
- 6 How is body heat generated in homeotherms?
- 7 Explain the functional morphology of vertebrate heart.
- 8 Discuss the steps involved in synaptic transmission.

(2x8=16 Marks)

III Write short notes on any FOUR of the following

9. Intracellular and extra cellular digestion.
10. Structure of a sarcomere.
11. Regulatory mechanisms of respiration.
- 12 Osmoregulation in hyperosmotic conditions.
13. Temperature regulating mechanisms.
14. Mechanism of nerve conduction.

(4x5=20 Marks)

10. ZOO3C11 : Developmental Biology and Endocrinology

Time : 3 Hours

Maximum 60 Marks

Part A -Developmental Biology

1. Answer any ONE out of two questions - 1x 12 = 12 Marks
2. Answer any TWO out of four questions - 2x 8 = 16 Marks
3. Answer any TWO out of three questions - 2x 5 = 10 Marks

Part B- Endocrinology

1. Answer any ONE out of two questions - 1x 12 = 12 Marks
2. Answer any TWO out of three questions - 2 x 5 = 10 Marks

ZOO3C11 : Developmental Biology and Endocrinology(Part A +B)

Time : 3 Hours

Maximum 60 Marks

1. Answer any TWO out of four questions - 2 x 12 = 24 Marks
2. Answer any TWO out of four questions - 2 x 8 = 16 Marks
3. Answer any FOUR out of six questions - 4 x 5 = 20 Marks

M.Sc. (Third Semester) Zoology

Model question paper

ZOO3C11 : Developmental Biology and Endocrinology

Time : 3 Hrs

Maximum: : 60Marks

Part A: Developmental Biology

I. Answer any ONE of the following:

1. Comment on Stem cells from embryo. “They are the first solution to organ transplantation”- comment on the statement with its pros and cons. Write briefly on latest development in stem cell research
2. Explain the biochemistry and physiology of fertilization

(1x 12 = 12 Marks)

II. Answer any TWO of the following:

3. Explain the role of genes in gametogenesis
4. Write an account on Morphogenetic movements
5. Explain the steps in organogenesis of *Caenorhabditis elegans*
6. Explain the role of genes in insect development

(2 x8= 16 Marks)

III. Answer any TWO of the following:

7. Primary organizer
8. Metamorphosis
9. Metaplasia

(2 x5 =10 Marks)

Part B: Endocrinology

IV. Answer any ONE of the following:

10. Comment Neuro-endocrine mechanism involved in moulting and growth in Crustaceans.
11. Comment on types of hormones in vertebrates and their role in growth and maturity

(1 x12 =12 Marks)

V. Answer any TWO of the following

12. Write an account on the synthesis of prohormones
13. Comment on Messenger and their role in gene regulation
14. Comment on hormone receptors in cells.

(2 x 5= 10Marks)

11. Z003E01 : General Parasitology and Helminthology

Time : 3 Hours

Maximum 60 Marks

Part A. General Parasitology

1. Answer any ONE out of two questions - 1x 12 = 12 Marks
2. Answer any TWO out of three questions - 2 x 5 = 10 Marks

Part B. Helminthology

1. Answer any ONE out of two questions - 1x 12 = 12 Marks
2. Answer any TWO out of four questions - 2x 8 = 16 Marks
3. Answer any TWO out of three questions - 2x 5 = 10 Marks

Z003E01 : General Parasitology and Helminthology(Part A +Part B)

Time : 3 Hours

Maximum 60 Marks

1. Answer any TWO out of four questions - 2 x 12 = 24 Marks
2. Answer any TWO out of four questions - 2 x 8 = 16 Marks
3. Answer any FOUR out of six questions -4 x 5 = 20 Marks

**M.Sc (Third Semester) Zoology
(2014 Admission onwards)**

Model Question Paper

Z003E01 : General Parasitology and Helminthology

Time: 3 Hours

Maximum: 60 Marks

Part A. General Parasitology

I. Answer any ONE of the following

1. Give an account on parasitic adaptations
2. What is parasitic zoonoses? Comment on the factors influence parasitic zoonoses and its social and economic impacts .

(1x12=12Marks)

II. Answer any TWO of the following

3. Parasitism and Altruism
4. Types of parasites
5. Evolution of parasites

(2 x 5 =10 Marks)

Part B. Helminthology

III Answer any ONE of the following

6. Explain the life cycle and pathology of *Wuchereria* and *Brugia*.
7. Write an account on the biology and life cycle of *Schistosoma mansoni*. Add a note on human schistosomiasis and its control measures.

(1x12=12Marks)

IV. Answer any TWO of the following

8. Describe the life cycle and biology of *Macracanthorhynchus*
9. Explain the life cycle and pathology of *Taenia solium*
10. Give an account on the life cycle of *Polystoma*
11. Present an account on the different types of cercaria found in digenetic trematodes.

(2x8=16Marks)

V. Answer any TWO of the following

12. Anti-snail measures
13. Pathogenesis and prevention of *Dracunculus*
14. Peculiarities in the life cycle of *Strongyloid stercoralis*

(2x5=10Marks)

SEMESTER IV

12. ZOO4C012: Biotechnology and Bioinformatics

Time : 3 Hours

Maximum 60 Marks

- | | |
|-----------------------------------------|---------------------|
| 1. Answer any TWO out of four questions | - 2 x 12 = 24 Marks |
| 2. Answer any TWO out of four questions | - 2 x 8 = 16 Marks |
| 3. Answer any FOUR out of six questions | -4 x 5 = 20 Marks |

M.Sc. (Fourth Semester) Zoology (2014 Admission onwards)

Model Question Paper

ZOO4C012: Biotechnology and Bioinformatics

Time: 3 Hours

Maximum: 60 Marks

I. Answer any TWO of the following

1. Give and account on gene cloning vectors employed in a genetic engineering laboratory.
2. Explain the various gene transfer methods. Add a note on transgenic organisms.
3. Write an essay on the hazards and impact of biotechnology on society.
4. Explain the various methodologies involved in DNA sequencing.

(2 X 12 = 20 Marks)

II Answer any TWO of the following

5. Explain microarray and gene expression analysis.
6. Describe the various methods employed in screening of recombinant DNA clones.
7. Give an account on biological databases and downloading of information from databases.
8. Write a short essay on the application of bioinformatics in phylogenetic analysis

(2 x 8 = 16 Marks)

III. Write short notes on any FOUR of the following

9. Gene therapy
10. Restriction endonuclease
11. Intellectual property right
12. Transcriptome
13. Simple sequence alignment
14. Chromosome walking

(4 x 5 = 20 Marks)

13. Z004E02: Protozoology and Medical & Veterinary Entomology

Time : 3 Hours

Maximum 60 Marks

Part.A - Protozoology

1. Answer any ONE out of two questions - 1x 12 = 12 Marks
2. Answer any ONE out of two questions - 1x 8 = 8 Marks
3. Answer any TWO out of three questions - 2x 5 = 10 Marks

Part B.- Medical & Veterinary Entomology

1. Answer any ONE out of two questions - 1x 12 = 12 Marks
2. Answer any ONE out of two questions - 1 x 8 = 8 Marks
3. Answer any TWO out of three questions - 2 x 5 = 10 Marks

Z004E02: Protozoology and Medical & Veterinary Entomology(Part A +Part B)

Time : 3 Hours

Maximum 60 Marks

1. Answer any TWO out of four questions - 2 x 12 = 24 Marks
2. Answer any TWO out of four questions - 2 x 8 = 16 Marks
3. Answer any FOUR out of six questions - 4 x 5 = 20 Marks

M.Sc. (Fourth Semester) Zoology
(2014 Admission onwards)

Model Question Paper

Z004E02: Protozoology and Medical & Veterinary Entomology

Time: 3 Hours

Maximum: 60 Marks

Part A – Protozoology

I. Answer any ONE of the following

1. Present an outline classification of parasitic protozoa giving diagnostic characters
2. Give an account on the present global status of malaria

(1 x12 = 12Marks)

II Answer any ONE of the following

3. Explain the life cycle and pathology of *Balantidium coli*
4. Explain the life cycle and pathology of *Bibesias bigemina*

(1 x 8 = 8 Marks)

III Answer any TWO of the following:

5. Amoebic dysentery
6. Human Trypanosomiasis
7. Kala azar

(2x 5 = 10Marks)

Part B - Medical & Veterinary Entomology

IV Answer any ONE of the following

8. Give a critical account on the role of arthropods as vector of human and animal diseases
9. Define myiasis. Explain different types of myiasis of medical and veterinary importance

(1x12 = 12Marks)

V. Answer any ONE of the following

10. Give an account on venomous arthropods
11. Explain the life cycle of *Sacculina*. Add a note on the parasite induced changes on the host

(1 x 8 = 8Marks)

VI. Answer any TWO of the following:

12. Life cycle of *Glossina*
13. Urtication
14. Triatomine bugs

(2x 5 = 10Marks)

14. ZOO4E03: Physiology, Biochemistry and Genetics of Parasites

Time : 3 Hours

Maximum 60 Marks

1. Answer any TWO out of four questions - 2 x 12 = 24 Marks
2. Answer any TWO out of four questions - 2 x 8 = 16 Marks
3. Answer any FOUR out of six questions - 4 x 5 = 20 Marks

M. Sc.(Fourth Semester)Zoology (2014 Admission onwards)

Model Question Paper

ZOO4EO3: Physiology, Biochemistry and Genetics of Parasites

Time: 3 Hours

Maximum: 60 Marks

I. Answer any two of following;

1. Explain the gene mapping in protozoa
- 2 Give an account of therapeutic use for better understanding of parasitic endocrine system
- 3 Describe metabolic specialization and adaptation in parasites.
- 4 . Write an account of parasite hormones.

(2X12=24 Marks)

II. Answer any two of following:

5. Describe carbohydrate metabolism in anaerobic protozoa
- 6 Explain parasitism and microenvironment in vertebrate alimentary canal.
- 7 Write and account of gene structure of Platyhelminthes.
- 8 Give an account of genetic exchange in Trypanosomes.

(2x8=16Marks)

III. Answer any four of following:

- 9 Explain the excretory system in parasites
- 10 Comment on ionic regulation in parasites.
- 11 What are the medical Implications of molecular parasitology
- 12 Brief account on neurotransmitters in Nematodes
- 13 Write an account of RNA editing.
14. Write an account of drug resistance in anaerobic parasites.

(4X5= 20 Marks)

.....

Dr. M.V.VASANDAKUMAR
Chairman- PG Board of Studies (Zoology)

