UNIVERSITY OF JAMMU
NOTIFICATION
(11/July/ ADP/21)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Competent Authority, has been pleased to authorize adoption of the revised Syllabi and Courses of Study in the subject of Zoology for Part I, II & III of Three Year B.Sc. (General) Course for the examinations to be held in the years as under alongwith %age of change:-

<table>
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<th>Class</th>
<th>Part</th>
<th>For the Examinations to be held in the year</th>
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<td>Paper-B- 20%</td>
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The alternative question papers are required to be set as per the regulations given below:-

i). If the change in the Syllabi and Courses of Study is less than 25%, no alternative Question papers to be set.

ii). If the change is 25% and above but below 50% alternative Question Papers to be set for one year.

iii). If the change is 50% and above or whole scheme is changed; alternative Question Papers be set for two years.

Sd/-
REGISTRAR

F.Acd./24/11/4345-89
Dated: 01-08-2011

Copy for information and necessary action to:
1. Special Secretary to Vice-Chancellor, University of Jammu;
2. Sr.P.A. to Registrar/Controller of Examinations;
3. Dean, Faculty of Life Sciences;
4. Convener, Board of Studies in Zoology;
5. Members of the Board of Studies concerned;
6. Principals of the concerned Colleges;
7. C.A. to Controller of Examinations;
8. Deputy/ Asstt. Registrar (Conf./Exams. U/G./Inf./Pub./Admission/DDE);
9. S.O (Confidential); and
10. Content Manager, University Website.

[Signature]
Asst. Registrar (Academics)
UNIVERSITY OF JAMMU
SYLLABI AND COURSE OF STUDY IN ZOOLOGY
FOR BSC PART –I FOR THE EXAMINATION TO BE

There shall be two written papers and one practical paper of 50 marks each. Each theory paper shall be of three hours duration and the practicals paper shall be of four hours duration. 20% of the marks shall be reserved for internal assessment in each theory paper and 50% in the practical paper. Each theory paper will be set for 40 marks and the practical paper for 25 marks. In case of the regular students internal assessment received from the college will be added to the marks obtained by them in the university examination and in case of private candidates marks obtained by them in the University examination shall be increased proportionately in accordance with the statutes / regulation.

1. Paper : A
2. Course /Paper Title : Life and Diversity of Animals
3. Total Contact Hours : 90 hrs.
4. Maximum Marks :
   i) External (Univ. Exam.) : 40
   ii) InternaJ Assessment : 10
5. Minimum Pass Marks :
   i) External : 14
   ii) Internal : 3.5
6. Duration of Univ. Exam. : 3 Hrs.

OBJECTIVES

The paper is meant to unfold the magnitude of diversity as it exists in the non-chordate world from microscopic protozoa to macroscopic but fascinating marine Echinodermate. Besides introducing animal diversity to beginners in Zoology, it is expected that the student will appreciate the streaks of unifying biological principles Common to all these diverse organisms. It is also expected that as the teaching of this syllabus progresses, a student will start appreciating the advent and evolutionary sequence from a cellular protozoa, though loose cell-aggregate in parazoa (sponges) to tissue grade organization in metazoa. The syllabus exposes students to the adaptive modifications fixed by specific habitats inhabited by diverse organisms.

SYLLABUS

Paper-A : Life and Diversity of Invertebrates 18 periods

UNIT -I
1.1 Introduction to kingdoms of organisms (Five kingdom system -a brief over view viz Monera, Protista, Fungi, Plantee & Animalia).
1.2 Protozoa
   1.2.1 Salient features and classification (uplo class level).
1.2.2 Structure, Locomotion, osmoregulation and reproduction of the following types:
  1.2.2.1 Paramecium
  1.2.2.2 Monocystis
  1.2.2.3 Amoeba (Self Study)
  1.2.2.4 Euglena

1.3 Porifera
  1.3.1 Salient features and classification (upto class level)
  1.3.2 Sycon
      1.3.2.1 Structural and functional morphology Sycon
      1.3.2.2 Reproduction of Sycon
      1.3.2.3 Histological elements of Sycon

UNIT II : Coelentrata and Helminthes 18 Periods
2.1 Coelentrata
  2.1.1 Salient features and classification (upto class level)
  2.1.2 Structure, Histology and life-cycle of the following types:
      2.1.2.1 Meteridium (Sea Anemone)
      2.1.2.2 Obelia (Self Study)
      2.1.2.3 Hydra

2.2 Helminths
  2.2.1 Salient features and classification of Platyhelminths (upto class level)
  2.2.2 Structure, reproduction, life cycle and pathogenesis of the following types:
      2.2.2.1 Fascicola hepatica
      2.2.2.2 Taenia solium

UNIT III : Annelida and Arthropoda 18 Periods
3.1 Annelida
  3.1.1 Salient features and classification (upto class level)
  3.1.2 Structural and functional morphology with special reference to locomotion, digestive system, circulatory system, Excretory system and reproductive system of the following types:
      3.1.2.1 Neries
      3.1.2.2 Earth worms

3.2 Arthropoda
  3.2.1 Salient features and classification (upto class level)
  3.2.2 Structural and functional morphology of the following types:
      3.2.2.1 Prawn
      3.2.2.2 Grass Hopper (Self Study)

UNIT IV : Mollusca and Echinodermata 18 Periods
4.1 Mollusca
  4.1.1 Salient features and classification (upto class level)
  4.1.2 Structure, digestive, Respiratory, nervous and reproduction system in Pila
  4.1.3 Shell in Mollusca (Self Study)
  4.1.4 Torsian in Mollusca

4.2 Echinodermata
4.2.1 Salient features and classification (upto class level)
4.2.2 Structure, water vascular, digestive, circulatory and reproductive system

UNIT V Animal forms, functions in Invertebrates 18 periods

5.1 Canal system in Porifera
5.2 Polymorphism in Siphonophora
5.3 Coral reef-formation, types & significance.
5.4 Metamerism in Annelids.
5.5 Concept of Coelom
5.6 Structure & significance of trophophore larva.
5.7 Nutrition in protozoa. (Self Study)
5.8 Crustacean larvae
5.8.1 Nauplius
5.8.2 Zoea
5.8.3 Mysis
5.8.4 Megalopa.
5.9 Echinodermate, larvae
5.9.1 Bipinnaria larvae
5.9.2 Pluteus larval forms.
5.9.3 Auricularia larvae.

Note for Paper Setter

Section A: 12 very short answer question are to be set with atleast two questions from each unit. The maximum length of answer shall be 20 words. All tie questions are compulsory. Each question will carry 1/2 marks, total weightage being 6 marks

Section B: This section will comprise of ten questions, with two questions from each unit. The maximum length of answer shall be 50 words to be attempted (one from each unit). Each question will carry two marks and the total weightage being 10 marks.

Section C: This section will comprise of five questions with one question from each unit. Student is to attempt three questions. Each question will carry 8 marks, total weightage being 24 marks.

Books Recommended

2. Protozoology-Kudo, Books & Periodicals Corporation (India).
5. Protozoology-Mackinen and Hawez, Canh University.
10. Invertebrate-Bordale and Potts. C.L.
UNIVERSITY OF JAMMU
SYLLABI AND COURSE OF STUDY IN ZOOLOGY
FOR BSC PART –I FOR THE EXAMINATION TO BE

There shall be two written papers and one practical paper of 50 marks each. Each theory paper shall be of three hours duration and the practicals paper shall be of four hours duration. 20% Of the marks Shall be reserved for internal assessment in each theory paper and 50 % in the practical paper. Each theory paper will be set for 40 marks and the practical paper for 25 marks. In case of the regular students internal assessment received from the college will be added to the marks obtained by them in the university examination and in case of private candidates marks obtained by them in the University examination shall be increased proportionately in accordance with the statues / regulation.

1. Paper : B
2. Course /Paper Title : Cell Biology Genetics and Evolution
3. Total Contact Hours : 90 hrs.
4. Maximum Marks : 50
   i) External (Univ. Exam.) : 40
   ii) InternaJ Assessment : 10
5. Minimum Pass Marks
   i) External. : 14
   ii) Internal. : 3.5
6. Duration of Univ. Exam. : 3 Hrs.

OBJECTIVES

This paper deals with Nuclear cytology, introducing students to various aspects of mitosis, meiosis, chromosome structure type and changes. This study along with the study of genetics gives the student an idea of raw material of evolution. The paper also exposes students to history of evolutionary though, pre and post Lamarckian, besides the process of natural selection and specialization.

Biogeography and paleontology are the two important facts of life through which a student is made to understand past and present distribution of animals and also understand the importance of evidences (geological) Supporting the idea of evolution.

SYLLABUS

Total periods: 90

Paper - B: Cell Biology, Genetics and Evolution

UNIT - I
1. Cell Structure and Functions
   1.1 Introduction to cell, cell theory prokaryotic and Eukaryotic cell.
1.2  Organization of cell.
    1.2.1  Structure of cell membrane with special emphasis on ‘fluid Mosaic Model’.
    1.2.2  Cytoplasmic organelles
        1.2.2.1  Mitochondria, Endoplasmic reticulum, Golgi apparatus, Ribosomes, Microbodies, Centrioles.
        1.2.2.2  Cytoskeleton (Self Study)
    1.2.3  Nuclear organization
        1.2.3.1  Cell nucleus, nuclear membrane, nuclear matrix and nucleolus.

UNIT II

2.  Chromosome structure and cell reproduction

2.1  Chromosome structure and types
    2.1.1  Morphology including matrix, chromonema, chromomere and telomere.
    2.1.2  Primary and secondary constrictions, chromatids and arms ratio
    2.1.3  Types of chromosomes
        2.1.3.1  Specialized chromosomes a) Lampbrush b)Polytene and c) supernumerary chromosomes.
    2.1.4  Chromosomal models

2.2  Cell Reproduction .
    2.2.1  Cell cycle
        2.2.1.1  Interphase
        2.2.1.2  Mitosis (M-Phase), Process, Phases and significance.
        2.2.1.3  Structure and function of spindle apparatus.

2.3  Meiosis
    2.3.1  Process, phases and significance.
    2.3.2  Synapsis and synaptonemal complex.
    2.3.3  Crossing over-mechanism and significance.

2.4  An elementary idea of cell transformation and cancer. (Self Study)

UNIT III

3.  Structural and numerical changes in chromosomes 18 periods and their significance

3.1  Structural changes
    3.1.1  Deficiencies/deletions
    3.1.2  Duplication
    3.1.3  Translocation
3.1.4 Inversions.

3.2 Numerical changes in chromosomes
   3.2.1 Aneuploidy
   3.2.2 Euploidy
      3.2.2.1 Haploidy
      3.2.2.2 Polyploidy

UNIT IV

4. Genetic material and inheritance 18 periods
   4.1 Mendelian law of inheritance; Neomendelism – An elementary idea
   4.2 Nature and function of genetic material
   4.3 Sex linked inheritance (eye colours in Drosophila and hemophilia in man.)
   4.4 Cytoplasmic inheritance
      4.4.1 Maternal effect on shell coiling in snails (Lymnaea).
      4.4.2 Kappa particles in Paramecium.
   4.5 Sex determination system; chromosomal; ploidy, Environmental (Self Study)

UNIT V

5. Paleontology and Evolution 18 periods
   5.1 Paleontology
      5.1.1 Fossil formation and types.
      5.1.2 Living fossils with special emphasis on latimeria and sphenodon.
   5.2. Evolution
      5.2.1 Origin of life
      5.2.2 Concepts and evidences of organic evolution
         5.2.2.1 Morphological evidences
         5.2.2.2 Embryological evidences
         5.2.2.3 PalaentologicaJ evidences
         5.2.2.4 Physiological and biochemical evidences
         5.2.2.5 Biogeographical evidences
   5.3 Neo-darwinism-Modern concept of organic evolution and speciation.
      5.3.1 Variations and their types
      5.3.2 Mutation -gene mutations.
      5.3.3 Isolating mechanisms (Self Study)

Note for Paper Setter
Section A: 12 very short answer question are to be set with atleast two questions from each unit. The maximum length of answer shall be 20 words. All tie questions are compulsory. Each question will carry 1/2 marks, total weightage being 6 marks.
Section B: This section will comprise of ten questions, with two questions from each unit. The maximum length of answer shall be 50 words to be attempted (one from each unit). Each question will carry two marks and the total weightage being 10 marks.

Section C: This section will comprise of five questions with one question from each unit. Student is to attempt three questions. Each question will carry 8 marks, total weightage being 24 marks.

Books recommended:
LABORATORY COURSE (PRACTICAL)  25 MARKS

1. Practical related to Non-chordates:
   - Study of external features of the following: Nereis: External features with special emphasis on Head & Parapodia of Nereis and Heteronereis phase.
   - Earthworm: Study of external features Including setae.
   - Leech: External morphology
   - Scorpion: External morphology & mouthparts
   - Pila, Unio: External morphology of Shell.
   - Starfish: External features.

2. Distinguishing characters & classifications of Protozoa to Echinodermate upto class only, exemplified by following animal types: Euglena, Trypanosoma, Amoeba, a Heliozon, a Radiolarian, Vorticella, Monocystis, Plasmodium, Sycon, Euspongia, Euplectella, Hyalonema, Hydra, Obelia, Companularia, Stylester, Millepora, Tubularia, Sertularia, Plumularia, Physalia, Velella, Porpita, Aurelia, Rhizostome, Heliochystis, Seaanemone, Corais, Beroe, Planaria, Fasciola, Dicrocoelium, Polystomum, Diplozoan, Schistosoma, Caryophyllus, Taenia, Echinococcus, Ascaris, Enterobius, Anclyostoma, Gordius, Echinorhynchus, a rotifer, Branchiulus, Nereis, Heteronereis, Aphrodite, Tubicola, Chaetocterus, Polygordius, Terebella, Serpula, Arenicola, Dero, Nais, Allolobophora, Entypheas, Lumbricus, Pherehima, Hirudinaria, Gephyraes, Sipunculus, Bonellia, Bugula, Saquita, Pontobdella, Glossiphonia, Hirudo, Balanus, Lepas, Crayfish, Prawn, Squilla, Hermit-crab Sacculina, Common insects, Scorpion, spider, Limulus, Millipede, Centipede; Chiton, Mytilus, Unio, Pecten, Lamellidens, Anodonta, a pearl Oyster, Nucula, Paramye solar, Teredo, Proleome, dentalium, Patella, Haliotus, Murex, Buccinum, Aplysia, Doris, Caunane, Helix, Lymnaea, Planorbin, Loligo, Sepia,
   - Octopus, Nautilus, Antedon, Asterias, Tentacerus, Astropscten, Holothuria, Echinus, Ochinarinus, Ophiothrix.

3. Dissection of the following animals to expose and study the various systems:—
   - Nereis: Alimentary Canal, Nervous system.
   - Earthworm: Alimentary canal, Reproductive system
   - Palaemon: Alimentary canal Nervous system
   - Pila: General anatomy, Nervous system.

4. Preparation of permanent stained mounts of the following:—
   - Obelia, Dicrocoelium, Geneo, Parapodium of Neries, Nephridium of Earth worm, Ovary of Earthworm, Statocyst of Prawn, Mouthparts and trachea of Cockroach, mouth parts of mosquito and Radula of Pila.

5. Study of the process of Mitosis through prepared slides.
6. Study of the process of meiosis through prepared slides.
8. Gene & Genetic Code - the chemical basis of Life - J.D. Cherayil.
10. Cellular Physiology and Biochemistry - W. D/Mcelvev.
There shall be two theory papers of 50 marks each. Each theory paper shall be of three hours duration and the practical paper of four hours duration. 20% of the marks in each theory paper and 50% of the marks in practical paper shall be reserved for internal assessment. Each theory paper will be set for 40 marks and practical paper for 25 marks. In case of regular students, internal assessment received from the colleges will be added to the marks obtained by them in the University examination and in case of private candidates, marks obtained by them in the University examination shall be increased proportionately in accordance with statutes/regulations.

PAPER A: CHORDATE LIFE, DIVERSITY AND FUNCTIONS

Max. Marks: 40

OBJECTIVES:

The paper deals with chordate diversity and in each group from fishes to mammals, evolutionary terminals along specific lines of evolution, indicating organizational perfection along such specialized lines, can be recognized. Nevertheless, the converse, picture of emerging and continuing evolution can be appreciated in perfection to tetrapod through amphibia from fishes and birds and mammals from reptiles. The diversity of these large animals adds to the fascinations of the biosphere.

SYLLABUS

UNIT I

1.1 Chordates – Origin of chordates
1.2 General characters and classification of chordates upto class level.
1.3 Hemichordata
   1.3.1 External morphology of Balanoglossus
   1.3.2 Affinities and systematic position of Balanoglossus

1.4 Urochordata (type: Herdmania)
   1.4.1 External morphology
   1.4.2 Digestive system
   1.4.3 Circulatory system
   1.4.4 Reproductive system
   1.4.5 Affinities

Total periods : 90
18 periods
1.5 Cephalochordata (type: Amphioxus)
   1.5.1 External morphology
   1.5.2 Digestive system
   1.5.3 Circulatory system
   1.5.4 Nervous system
   1.5.5 Affinities of Amphioxus (Self study)

UNIT II: Agnatha and pisces 8 periods

2.1 General characters and outline classification of Agnatha and Pisces upto order level.
2.2 Type: Petromyzon
   2.2.1 External features
   2.2.2 Digestive system and feeding
   2.2.3 Reproductive system
   2.2.4 Ammocoete larva
2.3 Type: Scoliodon
   2.3.1 External characters
   2.3.2 Digestive system
   2.3.3 Respiratory system
   2.3.4 Urinogenital system
   2.3.5 Central nervous system (Self Study)

UNIT III Amphibians and Reptilia 18 periods

3.1 General characters and classification of amphibians and reptiles upto order level.
3.2 Amphibia (Type: Frog)
   3.2.1 External features
   3.2.2 Digestive system
   3.2.3 Respiratory system
   3.2.4 Circulatory system
   3.2.5 Urinogenital system
   3.2.6 Central nervous system
3.3 Reptile (Type: Calotes)
   3.3.1 External features
   3.3.2 Digestive system
   3.3.3 Respiratory system
   3.3.4 Circulatory system
   3.3.5 Urinogenital system (Self Study)
   3.3.6 Central nervous system

UNIT IV: Aves and Mammalia 18 periods
4.1 General characters and classification of Aves and Mammalia upto order level.
4.2 Aves (Type: Pigeon)
4.2.1 External features
4.2.2 Digestive system
4.2.3 Respiratory system
4.2.4 Circulatory system
4.2.5 Urinogenital system
4.2.6 Central nervous system
4.3 Types of feathers in birds
4.4 Types of beaks in birds
4.5 Types of feet and claws in birds
4.6 Mammalia (Type: Rabbit)
4.6.1 External features
4.6.2 Digestive system
4.6.3 Respiratory system
4.6.4 Circulatory system
4.6.5 Urinogenital system
4.6.6 Central nervous system

UNIT V: 18 periods
5.1 Types of scales and fins in fishes
5.2 Migration in fishes
5.3 Parental care in fishes
5.4 Parental care in Amphibians
5.5 Migration in birds
5.6 Flight adaptation in birds
5.7 A brief account of extinct reptiles
5.8 Skin, its derivatives and uses in mammals (Horns, digital tips and antlers) (Self study)
5.9 Jaw suspension in vertebrates.

Note for the paper setters:
Section A: 12 very short answer questions are to be set with at least two questions from each unit. The maximum length of answer shall be 20 words. All the questions are compulsory. Each question will carry 1/2 marks, total weightage being 6 marks.

Section B: This section will comprise of ten questions, with two questions from each unit. The maximum length of answer shall be 50 words to be attempted (one from each unit). Each question will carry two marks and the total weightage being 10 marks.

Section C: This section will comprise of five questions with one question from each unit. Student is to attempt three questions. Each question will carry 8 marks, total weightage being 24 marks.
OBJECTIVES:

It deals broadly with animal functions, embryology and environmental biology. The student is introduced to some important functional aspects of endocrinology and reproductive biology. Some topics on the developmental biology have also been included in the course to acquaint the students with different patterns of development in animals.

This paper also introduces a student to the emerging and all important concepts of environmental biology so that he/she develops not only environmental awareness and understands hazards of depleting environment but also carry this message for the society in general. For this reason the student is exposed to a syllabus which aims at projecting the ecosystem concept magnifying the wholesomeness, its homeostasis and delicate balance that exists therein. Besides, the study deals with human interferences resulting in expression of environmental pollution.

SYLLABUS

UNIT I: Comparative Physiology in animals

1.1 Nutrition, feeding and digestion
   1.1.1 Types of nutrition and Feeding mechanisms (Microphagy ; macrophagy, Filter feeding) Self study
   1.1.2 Digestion – extracellular and intercellular types.
   1.1.3 Enzymatic digestion
   1.1.4 Hormonal control of digestion
   1.1.5 Symbiotic digestion.

1.2 Respiration
   1.2.1 Types of respiration ; Cutaneous respiration; branchial respiration; pulmonary and tracheal respiration
   1.2.2 Respiratory pigments and their role in gas transport
   1.2.3 Regulation of respiration in mammals

Total periods : 90
18 periods
UNIT II

2.1 Circulation
  2.1.1 Closed and open circulatory systems
  2.1.2 Types of heart and Patterns of blood flow: Chambered type, tubular type, pulsatile vessels, ampullary type.
  2.1.3 Pace maker, myogenic and neurogenic type of heart
  2.1.4 Thermoregulation

2.2 Excretion
  2.2.1 Excretory organs and nitrogenous wastes
  2.2.2 Ammonotelism, Ureotelism and Uricotelism (Self study)

2.3 Osmoregulation
  2.3.1 Osmoregulation in fresh water, marine estuarine and terrestrial environment.

UNIT III  Endocrinology of Reproduction  18 periods

3.1 general organization of pituitary gland in mammals
3.2 Hypothalamo hypophseal axis
3.3 Pituitary hormones
3.4 Pituitary-gonadal axis
3.5 Gonadal hormones and their functions
3.6 Menstruation in primates
3.7 Oesterous cycle in primates (Self study)

UNIT IV  Developmental Biology  18 period

4.1 Gametogenesis (Spermatogenesis and Oogenesis)
4.2 Fertilization: Egg sperm interaction, Acrosome reaction activation and polarity of egg.
4.3 Cleavage: Types and patterns; Elementary concepts of inner cell mass and stem cells.
4.4 Process of Blastulation and fate-map construction in frog.
4.5 Gastrulation in Frog upto the formation of three germinal layers.
4.6 Development of Amphioxus upto formation of coelom
4.7 Extra embryonic membrane of chick
4.8 Placentation in mammals
4.9 Retrogressive metamorphosis in Ascidians (Herdmania) (Self study)

UNIT V  Ecology: Ecosystem concept and energetic  18 periods
5.1 Ecology – its definition and relation to humanity
5.2 Ecological niche, habitat, biosphere, biome, ecotone
5.3 Ecosystem concepts and Homeostasis
   5.3.1 Energy flow in ecosystem
5.4 Primary productivity
5.5 Food chains: grazing food chains and detritus food chains
5.6 Food webs
5.7 Trophic structure and ecological pyramids such as pyramids in number, biomass and energy.

5.8 Analysis and evaluation of an ecosystem
   5.8.1 Abiotic and biotic factors
   5.8.2 Population and community structure
   5.8.3 Ecological succession

5.9 Human activity and animal resources
   5.9.1 Deleterious influence on wildlife resources - endangered species
   5.9.2 Animal improvement
   5.9.3 Pollution: (Self Study)
      5.9.3.1 Air pollution
      5.9.3.2 Water pollution
      5.9.3.3 Noise pollution

5.9.4 Conservation of natural resources

Note for the paper setters:
Section A: 12 very short answer question are to be set with at least two questions from each unit. The maximum length of answer shall be 20 words. All tie questions are compulsory. Each question will carry ½ marks, total weightage being 6 marks.

Section B: This section will comprise of ten questions, with two questions from each unit. The maximum length of answer shall be 50 words to be attempted (one from each unit). Each question will carry two marks and the total weightage being 10 marks.

Section C: This section will comprise of five questions with one question from each unit. Student is to attempt three questions. Each question will carry 8 marks, total weightage being 24 marks.

Books recommended:
3. Text Book of Zoology – Parker and Haswell Vol. II
5. Comparative Anatomy - M.D.L. Srivastava
6. Comparative Anatomy – Kingley
7. Life of Mammals – J.Z. Young
8. Plaentology – A.S. Roamar
9. Evolution by Dodson
11. Ecology – Odom
12. Ecology by Kermondy
13. Elements of Ecology – Brij, Gopal and Bhardwaj
14. Field Biology – Benten and Wegner
15. Wildlife of India – Sahasia
16. Animals and Environment – Vernberg
17. Wildlife Ecology –Aeron
18. Wildlife Management – Dasmann
20. Chordate structure and function – Waterman, A.N. and Others
21. General and Comparative Physiology – W.S. Hoar
23. comparative animal physiology-prosper; C. L.
25. An Introduction to Embryology –Balinsky
26. Biology of Developing System – Grant
27. Developmental Biology – Gilbert.
This paper deals with practicals pertaining to animal diversity (Chordate); Comparative anatomy (Protochordates through chordate).

1. Study of external features of the following types:

**Amphioxus:** With special reference to oral hood, Velum, branchial wall, section through various regions.

**Herdmania:** With special reference to test, test spicules, branchial basket/neral gland.

**Balanoglossus:** With particular stress on anterior region through sagittal sections.

**Cyclostoma:** *Petromyzon, Myxine*

**Elasmobranchi:** *Scoliodon*

**Teleostomi:** *Cyprinus carpio*

**Amphibia:** Frog, Salamander

**Reptiles:** *Uromastix*, turtle

**Birds:** Columba, Fowl

**Mammals:** Rabbit, Squirell

2. Distinguishing characters and classifications of protochordate through chordate (upto orders only) exemplified through following animal types:

Pyrosoma, Botryllus, Salpa, Ammocoetus larva, Zygaena, Stegostoma, Dasytis, Heptanchus, Charchardon, Pritis, Tarpedo, Rhinobatis, Chimera Protopterus, Acipenser, Lepidostris Amia, Salmo, barbus, Cyprinus, Schithorax, Clarias, Heteropneustes, Glyptothorax, Botia, Nemachuiulus, Ophicephalus, Ecocoeptus Pleuronectos, Anguilla, Gambusia

Vulpes, Herpestes, Phoca, Otario, Elephus, Halicore, Dugang, Mantiees, Equas, Rhinoceros, Sus, Hipposotamus, Dicotyles, Cow, Buffalo, Sheep, Goat.

3. Dissect the following animals to study the various systems:
   **Scoliodon:**
   i) Aortic arches ii) Urinogenital system
   iii) Cranial nerves iv) Taking out pituitary

4. Preparation of permanent mounts of the following:
   i) Velum, Oral hood and Pharyngeal of Amphioxus.
   ii) Ampulla of Lorenzini, Placoid scale, Ctenoid scale of fish, striped muscles of frog from pectoral girdle or thigh.

5. Study of following skeleton:
   i) Skull of frog and varanus
   ii) Skeleton of fowl and rabbit

6. Study of types of eggs (Frog, Reptiles and Birds)
7. Study of chick embryology through stained mounts (18 Hrs.; 24 Hrs.; 36 Hrs.; 48 Hrs.; 72 Hrs.)
8. Muscle-Nerve Preparation (Gastememus Muscle of frog alongwith its nerves to demonstrate reflexes)
9. Experimental demonstration of Oxygen consumption during respiration of cockroach or any other animal e.g. fish
13. Study of histology of different endocrine glands from prepared slides (pituitary, Arrenal, Thyroid, pancreas, Gonads)
14. Demonstration of different types of Placenta in mammals through models or preserved specimens.
15. Study of types of feet and claws, feathers and beaks in birds.
There shall be two written papers and one practical paper of 50 marks each. Each theory paper shall be of three hours duration and the practical paper shall be of four hours duration. 20% of the marks shall be reserved for internal assessment in each theory paper and 50% in the practical paper. Each theory paper will be set for 40 marks and the practical paper for 25 marks. In case of the regular student's internal assessment received from the college will be added to the marks obtained by them in the university examination and in case of private candidates marks obtained by them in the University examination shall be increased proportionately in accordance with the statues/ regulation.

Paper A: PARASITOLOGY

MAXIMUM MARKS: 40

OBJECTIVE

The Course is designed to introduce the student to the fundamental of parasitology so that the knowledge thus gained could be useful to them in the later walk of life as extension specialists or as scientific investigations. The course entails a broad view of morphology biology and biomics of the parasites of specific to man.

DETAILED SYLLABUS

UNIT I

TOTAL PERIODS: 90

1.1 Scope and definition of parasitology
1.2 Symbiotic relationship and its types
1.3 Concept of susceptibility
1.4 Concept of Immunity
1.5 Vector and host types and interdependence.
1.6 Types of parasitic relationships in animal kingdom.
1.7 Parasitic adaptation and degeneration (Self-study)

(18 periods)

UNIT II

2.1 Structure of virus with special reference to bacteriophage.
2.2 Classification of viruses.
2.3 Study of following diseases caused by viruses in man, their symptoms, mode of transmission and preventive measures.
   2.3.1 AIDS
   2.3.2 RABIES
   2.3.3 MEASLES
2.4 Structure of Bacteria
2.5 Study of following bacterial diseases of man, their symptoms, mode of transmission and preventive measures.
   2.5.1 Tuberculosis
   2.5.2 Dysentery (Bacillary)
   2.5.3 Cholera (Self Study)

UNIT III
Habit, Habitat, general morphology, specific adaptability, mode of transmission, life cycle, pathogenesis and prophylaxis of the following protozoan parasites of man
3.1.1 Giardia
3.1.2 Trypanosoma
3.1.3 Entamoeba
3.1.4 Plasmodium
3.1.5 Leishmania and Balantidium coli (Self Study)

UNIT IV

4.1 Habit, habitat, general morphology, specific adaptability mode of transmission, life cycle, pathogenesis and prophylaxis of the following parasites of the man.
   4.1.1 Schistosoma
   4.1.2 Fasciolopsis buski (self study)
   4.1.3 Diphyllobothrium
   4.1.4 Echinococcus
   4.1.5 Filaria
   4.1.6 Ancylostoma
   4.1.7 Acanthocephala: General organization and economic importance

UNIT V

5.1 Gastro-intestinal tract as habitat of protozoan and helminth parasites of man
5.2 Blood and lymph as habitat of nematode parasites of man.
5.3 Reticulo endothelial system as habitat of protozoan parasite of man (Self Study)
5.4 Host – parasite specificity

NOTE FOR PAPER SETTING

Section A: 12 very short answer question are to be set with at least two questions from each unit. The maximum length of answer shall be 20 words. All tie questions are compulsory. Each question will carry 1/2 marks, total weightage being 6 marks

Section B: This section will comprise of ten questions, with two questions from each unit. The maximum length of answer shall be 50 words to be attempted (one from each unit). Each question will carry two marks and the total weightage being 10 marks.
Section C: This section will comprise of five questions with one question from each unit. Student is to attempt three questions. Each question will carry 8 marks, total weightage being 24 marks.

Books Recommended
1. Cemeron, D. Parasites and Parasitism
2. Kudo, P.R. Protozoology
5. Hyman, H. The Invertebrate Protozoa Through Ctenophora
8. Thomas Chang (1964) The Biology Of animal Parasites Toppan Co Ltd. Tokyo, Japan
9. Chitwood & Chitwood
10. The Biology of animal

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SYLLABI AND COURSE OF STUDY IN ZOOLOGY
FOR BSC PART –III FOR THE EXAMINATION TO BE

There shall be two written papers and one practical paper of 50 marks each. Each theory paper shall be of three hours duration and the practical paper shall be of four hours duration. 20% of the marks shall be reserved for internal assessment in each theory paper and 50% in the practical paper. Each theory paper will be set for 40 marks and the practical paper for 25 marks. In case of the regular students internal assessment received from the college will be added to the marks obtained by them in the university examination and in case of private candidates marks obtained by them in the University examination shall be increased proportionately in accordance with the statues/regulation.

Paper –B: Economics Zoology

40 Marks

Objective

The course deals broadly with Economics zoology besides providing an insight into the relative usefulness of animals as human food. The course introduces the students to some important economic aspects of zoology, a line which they may ultimately choose to develop for their self-employment (whole time or part time).

DETAILED SYLLABUS

UNIT I:- AQUACULTURE

1.1 Definition and scope of Aquaculture
1.2 Monoculture
   1.2.1 Prawn culture
   1.2.2 Pearl culture
   1.2.3 Crab culture
   1.2.4 Trout culture
1.3 Polyculture (Composite fish culture)
1.4 induced Breeding in fishes
1.5 Economic importance of fishes (Self study)

TOTAL PERIODS :90
   (18 Periods)

UNIT II: APICULTURE SERICULTURE AND LAC CULTURE (18 period)

2.1 Apiculture:
   2.1.1 General morphology of honey bees, laying special stress on mouth parts and appendages of workers
   2.1.2 Life cycle of Honey-bee
   2.1.3 Uses of honey & Bee – Wax; composition of honey
   2.1.4 Methods use in Apiculture
   2.1.5 Predators and Parasites of honey bee
2.1.6 Bee Venom as medicine

2.2 Sericulture:
   2.2.1 Life Cycle of silk worm
   2.2.2 Silk producing insects in India and kinds of silk fibers produced
   2.2.3 Economic Importance of Silk worm
   2.2.4 Mulberry cultivation for sericulture (Self study)
   2.2.5 Principles of silk worm rearing
   2.2.6 Pebrine Disease, Its Genesis Pathogensis And Prophylaxis

2.3 Lac Culture
   2.3.1 Life Cycle of Lac Insect
   2.3.2 Lac Cultivation, Formation and Uses

UNIT III Poultry and cattle farming

3.1 Poultry farming
   3.1.1 Breeds of Poultry birds and their characteristics; Rhode island red; white- Leghorn; Black Minorca; Aseel, Chittagong
   3.1.2 Poultry breeding and rearing
   3.1.3 Poultry feed and quality food
   3.1.4 Poultry diseases: causes, symptoms, mode of transmission and prophylaxis of the following poultry diseases, Ranikhet, Coccidiosis and Avian tuberculosis.

3.2 Cattle Farming
   3.2.1 Breeds of dairy cattle and their characteristics Red sindhi sahiwal, Red Dane Haryana, holstien – Friesian Jersy
   3.2.2 Feeding and fodder (Self study)
   3.2.3 Cattle diseases: mastitis, anthrax, Foot and mouth diseases
   3.2.4 Integrated animal farming

UNIT IV: Animal Pests
4.1 Nematode parasite of potato, tomato and wheat.
4.2 Insect Pests:
   4.2.1 Insect pests of stored food: diagnostic features, extent of damage and control measures.
      4.2.1.1 Sitophilous oryze (Rice – Weavil)
      4.2.1.2 Tribolium castenum (red – flour beetle)
      4.2.1.3 Rhizopertha dominica
   4.3 Insect Pests of standing crops
      4.3.1 Leptocorsia vericornis (Rice- Gundhi Bug)
4.3.2 Pectinophora gossypiella (Pink-boll worm of Cotton)
4.3.3 Diacrisia Oblique (Bihar – hairy Caterpillar)
4.4 Insects as vectors of human diseases
4.5 Ticks and mites: their harms, role and control
4.6 Snakes
   4.6.1 poisonous snakes and venom
   4.6.2 Role of snakes in rodent pest control
4.7 Birds:
   4.7.1 Birds as pest
   4.7.2 Role of birds in pest control (Self Study)

UNIT V: BIOTECHNOLOGY:
5.1 General concepts of biotechnology
5.2 Biotechnology in live stock:
   5.2.1 in-vitro fertilization
   5.2.2 Artificial insemination
   5.2.3 Surrogate mothers : embryo transfer technology
   5.2.4 Cloning (basic concept)
5.3 Applications of biotechnology
   5.3.1 Biogas (Self Study)
   5.3.2 Biofertilizers
   5.3.3 Bioinsecticides
   5.3.4 Antibiotics

NOTE FOR PAPER SETTING

Section A: 12 very short answer question are to be set with atleast two questions from each unit. The maximum length of answer shall be 20 words. All the questions are compulsory. Each question will carry 1/2 marks, total weightage being 6 marks

Section B: This section will comprise of ten questions, with two questions from each unit. The maximum length of answer shall be 50 words to be attempted (one from each unit). Each question will, carry two marks and the total weightage being 10 marks.

Section C: This section will comprise of five questions with one question from each unit. Student is to attempt three questions. Each question will carry 8 marks, total weightage being 24 marks.

Books Recommended
1. Ullal S.R. and Narsimabanna
2. Technology of fishes, Acad. Press London
4. Stickney, R R (1979) Principle of warm water aquaculture, John Willey & Sons New Delhi
6. Kurian C V and Sebastian V C, Prawns and prawn Fisheries of India Hindustan Publ Corp (India) New Delhi
12. Roberts. S.O. Veterinary Obaterrics and genital diseases
13. Shukla and Upadhya Economic Zoology
14. Kovaleve, P.A. Silkworm breeding stocks Central Silk Broad, Marine, Drive Bombay
15. Roger, A Morse, The ABC and XYZ of Bee Culture A.I. Root & Co Medina, Ohio

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SYLLABUS AND COURSE OF STUDY IN ZOOLOGY
LABORATORY COURSE (PRACTICAL) 25 MARKS

1. Morphology of head, wing, legs, thorax, and abdomen of honey-bee
2. Study of mouth parts, sting apparatus and hind legs of honey-bee from prepared slides
3. Study of life history of honey-bee
4. Study of life history of Bombyx mori using preserved specimen
5. Study of type of silk fibers from prepared slides
6. Candling of egg of fowl for differentiation of the fertilized eggs from the unfertilized eggs
7. Study of the following insect pest
   i) Rice- weevil  ii) Red flour beetle
   iii) Lesser Grain borer  iv) Rice- Gundi bug
   V) Pink boll worm of cotton  VI) Bihar hairy caterpillar
8. Collection and preservation of insect pests
9. Identification and culture of fish food organism (protozoa, rotifers and catfish air-breathing fish)
10. Identification of major and minor carps locally available (catfish air-breathing fish)
11. a) Study of Sea - anemone and hermit crab as an example of communalism
    b) Study of poly flagellates from gut of termites as an example of symbiosis
12. Study of structure of bacteria from the curd culture
13. Study of the following protozoan parasites through slides
    1) Leishmania  2) Trypanosoma
    3) Entamoeba  3) Plasmodium
14. Study of metazoan parasites of fish and poultry from live specimens
15. A visit to sericulture farm for the study of life cycle of Bombyx mori, different types of cocoons and silk spinning techniques.
16. A visit of apiculture farm.
17. A visit to poultry farm.
18. A visit to dairy farm
19. A visit to fish farm/aquarium
20. A visit to university Zoological Park
21. Study of ticks and mites from prepared slides
22. Study of common poisonous snakes from specimens
23. Aquaculture: identification of cultivable

   a) Prawn, crab, lobster
b) Clams, mussel and oyster  
c) Food fishes  
d) Ornamental and exotic fishes  

23 Study of parasitic (bed bug and lice) and predatory insects (praying mantis and dragon fly) in relation to their adaptations.

24

25 Viva-voce