UNIVERSITY OF MUMBAI
No.UG/130 of 2009

CIRCULAR: -

A reference is invited to the Ordinances, Regulations and syllabi relating to the B.Sc. degree course **vide** Pamphlet No.141 and to this office Circular No.UG/76 of 2003 dated 27th February, 2003 and the Principals of the affiliated Colleges in Science are hereby informed that the recommendation made by the Board of Studies in Zoology at its meeting held on 22nd December, 2008 has been accepted by the Academic Council at its meeting held 13th February, 2009 **vide** item No.4.2 and that, in accordance therewith, the syllabus of S.Y.B.Sc. in the subject of Zoology has been revised as per **Appendix** and that the same will be brought into force with effect from academic year 2009-2010.

MUMBAI-400032
4th May, 2009.

for REGISTRAR

To,
The Principals of the affiliated colleges in Science.

A.C./4.2/13.02.2009

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No. UG/130-A of 2009, MUMBAI-400 032 4th May, 2009

Copy forwarded with compliments for information to :

1) The Dean, Faculty of Science.
2) The Chairman, Board of Studies in Zoology.
3) The Controller of Examinations.
4) The Co-ordinator, University Computerization Center.

04/05/09

(D. H. KATE)
DEPUTY REGISTRAR
(U.G./P.G.Section)

4/5

Copy to :

The Director, Board of College and University Development, the Deputy Registrar (Eligibility and Migration Section), the Director of Students Welfare, the Personal Assistants to the Vice-Chancellar, the Pro-Vice-Chancellor, the Registrar and the Assistant Registrar, Administrative, Ratnagiri for information.

The controller of examinations (10 copies), the Finance and Accounts officer (2 copies), Record Section (5 copies), Publications Section (5 copies), the Deputy Registrar, Enrollment, Eligibility and Migration Section (3 copies), the Deputy Registrar, Statistical, Affiliation Section (2 copies), the Director, Institute of Distance Education, (10 copies) the Director University Computer Center (IDE Building), Vidyanagari, (2 copies) the Deputy Registrar (Special Cell), the Deputy Registrar, (PRO). The Assistant Registrar, Academic Authorities Unit (2 copies) and the Assistant Registrar, Executive Authorities Unit (2 copies). They are requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to in the above Circular and that no Separate Action Taken Report will be sent in this connection. The Assistant Registrar Constituent Colleges Unit (2 copies), BUCT (1 copy), the Deputy Accountant in charge Director, Centralize Computing Facility (1 copy), the

Enclosure to Item No. 4.2
13-2-2009

UNIVERSITY OF MUMBAI

Revised Syllabus for the

S.Y.B.Sc

In

Zoology

(With effect from the academic year 2009-2010)

REVISED SYLLABUS OF S.Y.B. SC. ZOOLOGY
(w.e.f. from the academic year 2009-10)

Preamble

Board of Studies in Zoology during its meeting held on 1st August 2008 decided to revise the syllabi of F.Y., S.Y. and T.Y. B.Sc. and constituted a syllabus committee of board members and senior teachers from various colleges affiliated to the University of Mumbai. The committee revised the syllabus of F. Y.B. Sc. which was introduced in academic year 2008-09 after proper approval of concerned University bodies. As per next step, the committee has prepared draft of revised S.Y.B.Sc. syllabus. The same draft was circulated among the heads and senior teachers of Zoology department for suggestions. A final meeting of the syllabus committee was held on 29th November 08 to finalize the S.Y.B.Sc. syllabus. After discussion and debate necessary changes have been incorporated in the syllabus. The Board of Studies in Zoology in its meeting held on 22/12/2008 resolved that the revised syllabus of S.Y. B.Sc. Zoology be accepted and made effective from the academic year 2009-10.

Date 29th November 2008

Chairman
Board of Studies in Zoology

REVISED SYLLABUS OF S.Y. B.Sc. IN THE SUBJECT OF ZOOLOGY
with effect from academic year 2009-2010

Note
There will be three papers each carrying 60 marks.
Each paper will be divided into 6 units:
Units 1 to 3 to be covered in the first term and
Units 4 to 6 to be covered in the second term
Each term will have 45 lectures per paper.

DISTRIBUTION OF TOPIC S AND LECTURES

PAPER I

Title of Paper- Animal Kingdom, Developmental Biology, Cellular Organization, Ecology and Ethology

Term	Unit	Topic	Number of Lectures
First	1	Unicellular, Multicellular Acoelomate life	15
	2	Developmental Biology	15
	3	Ecology	15
Second	4	Chordate life	15
	5	Cellular Organization	15
	6	Ethology	15

Paper II

Title of Paper- Biochemistry, Molecular Biology, Biotechnology, Bioinformatics, Genetics and Evolution.

Term	Unit No	Title of Topic	Number of Lectures
First	1	Biochemistry	15
	2	Molecular Biology	15
	3	Genetics	15
Second	4	Biotechnology	15
	5	Applied Biotechnology and Bioinformatics	15
	6	Evolution	15

Paper III

Title of Paper- Applied and Economic Zoology

Term	Unit No	Title of Topic	Number of Lectures
First	1	Introduction to Parasitology and Protozoan Parasites	15
	2	Economic Entomology	15
	3	Animal farming - I	15
Second	4	Helminth Parasitology	15
	5	Fisheries	15
	6	Animal farming - II	15

Note:

i) Two short field excursions for habitat studies are compulsory.

ii) Field work of not less than eight hours duration is equivalent to one period per week for a batch of 15 students.

iii) No topic from the syllabus should be assigned as a project work or seminar.

iv) A candidate will be allowed to appear for the practical examination only he / she submits a journal of S. Y. B. Sc. Zoology certified by the Head of the Department / Institute to the effect that the candidate has completed the practical course of S. Y. B. Sc. Zoology as per the minimum requirement. In case of loss of journal a candidate must produce a certificate from the Head of Department /Institute that the practicals of academic year were completed by the student. Such a candidate will be allowed to appear for the practical examination but the marks allotted for the journal will not be granted.

PAPER I: Animal Kingdom, Developmental Biology, Cellular Organization, Ecology and Ethology

UNIT I WONDERS OF ANIMAL KINGDOM (15)

1.1 Unicellular, Multicellular and Acoelomate life

1.1.1 Protozoa: Skeleton and Reproduction
1.1.2 Porifera: Canal system, spicules and reproduction
1.1.3 Coelenterata : Polymorphism, Types and theories of formation of coral reefs
1.1.4 Helminthes: Parasitic adaptations in helminthes

1.2 Coelomate life
1.2.1 Annelida: Reproduction
1.2.2 Arthropoda : Crustacean larvae and metamorphosis in insects
1.2.3 Mollusca: Shell and torsion
1.2.4 Echinodermata: Water vascular system and larvae

UNIT II DEVELOPMENTAL BIOLOGY (15)

2.1.1 Fertilization and parthenogenesis
2.1.2 Eggs and cleavages
A) Types of eggs
B) Types of cleavage
2.1.3 Types of Blastula
Ex.. Amphioxus, frog, bird and mammal
2.1.4 Gastrulation
Epiboly and Emboly- invagination, involution and infiltration
2.1.5 Fate of three germinal layers and coelom formation

UNIT III ECOLOGY (15)

3.1.1 Ecosystem – Concept of ecosystem, major and minor ecosystem, natural and artificial ecosystem
3.1.2 Abiotic factors:
a) Edaphic: Components of soil and soil profile
b) Climatic: Light, temperature and precipitation
c) Topographic.
3.1.3 Major natural ecosystems
a) Marine
b) Freshwater
c) Terrestrial: Forest, Grassland and Desert biomes

3.1.4 Population Ecology – Concept of dynamic nature.
Factors influencing population dynamics –natality, mortality, survivorship curves, migration, density, age structure and sex ratio

3.1.5 Community ecology: Concept of ecological niche and ecological succession

UNIT IV CHORDATE LIFE (15)

4.1. Protochordates:
Retrogressive metamorphosis in Ascidians

4.2. Vertebrate life:

4.2.1 Swim bladder, breeding and parental care in fishes

4.2.2 Neoteny and parental care in amphibians.

4.2.3 Adaptive radiation in reptiles

4.2.4 Venomous and non-venomous snakes

4.2.5 Migration in birds

4.2.6 Egg laying mammals and marsupials

4.2.7 Aquatic mammals

UNIT V CELLULAR ORGANIZATION (15)

5.1.1 Structure and function of plasma membrane
Importance of membrane fluidity and asymmetry, Membrane transport: Passive diffusion, facilitated transport, active transport Exocytosis and endocytosis

5.1.2 Cytoplasmic membrane systems: Structure and Function

A) Endoplasmic reticulum : SER, RER
B) Golgi complex
C) Lysosome: Primary and secondary lysosomes

5.1.3 Mitochondria:
Structural organization, Chemical energy and ATP, Krebs cycle, Electron transport and oxidative phosphorylation.

5.1.4 Structure of nucleus and nucleolus:
Nuclear pore and pore complex, Nucleolus, Organization of chromatin and chromosomes, Polytene and Lamp brush chromosomes

UNIT VI ETHOLOGY

(15)

6.1 Concept of instinct, Innate Release Mechanism and Fixed Action Pattern, Significance of instincts

6.2 Concepts of imprinting: Long term and functional aspect of imprinting

6.3 Displacement behaviour: Causes and functional aspects, Ritualization of displacement activities

6.4 Animal communication: Components necessary for communication, Signals- chemical, light and sound, Language development in Bees and Primates, Concept of interception and deception

PRACTICAL I

1. Mounting of Foraminiferan shells from sand.
2. Observation of binary fission and conjugation in Paramecium (Permanent Slide).
3. Observation of V.S of Grantia and L.S of Leucosolenia.
4. Observation of Polymorphism: Obelia colony and medusa, Physalia, Velella, Porpita.
5. Observation of corals: Fungia, Madrepora, Meandrina (Brain coral), Tubipora and Sea fan
6. Observation of T S of Liver Fluke and liver fluke larvae
7. Observation of Heteronereis and Trochophore larva
8. Study of Crustacean larvae: Nauplius, Cypris, Zoea, Megalopa, Alima, Mysis and Phyllosoma
9. Study of Metamorphosis in insects:
   I. Juvenile and adult of Lepisma.
   II. Different stages in the life history of Housefly, Mosquito (Culex or Anopheles), Beetle and Butterfly.
10. Study of shells in Molluscs: Chiton, Dentalium, Trochus, Placuna, Solen, Sepia, Nautilus, Sinistral and Dextral shells.
11. Study of Echinoderm larvae: Bipinnaria, Ophiopluteus, Echinopluteus, Auricularia, Doliolaria
12. Study of Ascidian Tadpole (Retrogressive metamorphosis).
13. Swim Bladder (in- situ)
14. Study of following organisms with reference to breeding and parental care: Sea horse, Gouramy, Siamese fighter, Catfish, Tilapia, Caecilian, Midwife Toad (if specimens depicting nests and clutches of eggs are not available, pictures should be displayed), and neoteny: Axolotl larva.

15. Adaptive radiation in Reptiles: Turtle, Tortoise, Chameleon, Phrynosoma, Wall lizard, Rat snake, Sea snake, Crocodile or Gharial.
16. Venomous snakes: Krait, Cobra, Russel's viper, Sawscaled viper, Jaw of any venomous snake to show the fangs and poison apparatus.
17. Mammals: Duck billed platypus, Kangaroo, Bottle nose dolphin, Blue whale, Sea cow.
18. Study of different types of eggs: Isolecithal (Homolecithal)- Amphioxus or Mammal, Mesolecithal- Frog or Fish or Mollusc, Discoidal or Highly telolecithal- Hen egg.
19. Study of blastulae: Amphioxus, Frog, Mammal.
20. Study of gastrulae- Frog, Primitive streak and section passing through primitive streak of chick embryo.
21. Quantitative estimation of DO of Water.
22. Quantitative estimation of phosphate phosphorus.
23. Quantitative estimation of free carbon dioxide in water.
24. Quantitative estimation of salinity of water – Argentometry
25. Determination of total hardness of water.
26. Determination of pH of soil.
27. Determination of moisture content of soil.
28. Determination of texture of soil (only coarse and fine fraction).

REFERENCE BOOKS:

1. Fundamentals of Ecology –by E.P Odum, Saunders Publication
2. Principles of Environment Science: Inquiry and Application W.P Cunningham and M.A Cunningham, Tata McGraw Hill
3. Ecology – principles and Application – J L Chapman and M.J.Reiss, Cambridge University Press. Low Priced Edition.
4. Animal Behavior- David McFarland: Pitman Publication
5. An Introduction to Animal Behavior, IV Edition A. Manning and M.S Dawkins, Cambridge University Press. Low Priced Edition
6. Animal Behavior- M.P Arora, Himalaya Publication
7. Zoology – S.A Miller and J.B Harley, Tata McGraw Hill
8. Biological Science, 3rd Edition D.J. Taylor, N.P.O Green and G.W. Stout, Cambridge University Press. Low Priced Edition.
9. Fundamentals of Ecology, 2nd Ed. M.G.Dash, Tata McGraw Hill.
10. Invertebrate Zoology, Vol. I, Jordan and Verma, S. Chand and Co.
11. Vertebrate Zoology, Vol. II, Jordan and Verma, S. Chand and Co.
12. Introduction to Vertebrates, Moore, Cambridge University Press. Low Priced Edition
13. Chordate Embryology (Development Biology), P.S Verma and A.K.Agarwal, S. Chand and Co
14. Development of Biology, T Subramaniam, Narosa Publication
15. Principles of Animal embryology, P.G.K Nair and K.P Achar

Paper II

Title of Paper- **Biochemistry, Molecular Biology, Biotechnology, Bioinformatics, Genetics and Evolution.**

Unit-I : **Biochemistry:**

15

1.1 WATER, THE BASIC MOLECULE OF LIFE

1.1.1. Molecular structure of water: Tetrahedral geometry, Hydrogen bond and flickering clusters, Macromolecular association.

1.1.2. Physical and chemical properties of water: Density, specific heat, heat of vaporization, heat of fusion, surface tension. Hydrogen bonds with solutes. Interaction with nonpolar compounds. Water as a reactant.

1.1.3 Ionization of water, K_w ion product of water, pH scale.
Dissociation of weak acids and weak bases, pK_a, Henderson-Hasselbalch equation.
Titration curves of weak acids.
Buffers in biological systems.

1.2. Metabolism

1.2.1. **An overview of metabolism:**
Thermodynamics: Concepts of entropy, negentropy and enthalpy.
Intermediary metabolism, how major anabolic and catabolic pathways are interconnected. Acetyl -CoA as a common product in metabolism of carbohydrates, proteins and lipids.

1.2.2. **Carbohydrate Metabolism**:
Significant pathways of Carbohydrate Metabolism-an overview
Glycolysis and TCA cycle- Reactions, Enzymes. Anaerobic pathway. Electron transport and oxidative phosphorylation.

1.2.3. **Lipid Metabolism:** Overview, Triacylglycerol, β-Oxidation.

1.2.4. **Protein Metabolism**: Overview. Amino acid pool, essential and non-essential amino acids. Metabolism of Amino Acids- transamination, deamination (oxidative and non-oxidative).

Unit-2: Molecular Biology:

15

2.1 Biosynthesis of DNA-Semi conservative method

2.2 Transcription in Prokaryotes: Initiation, elongation, termination of m-RNA, E. coli RNA polymerase.

2.3. Transcription in Eukaryotes: Initiation, elongation, termination of m-RNA, RNA polymerases of eukaryotes. Differences in transcription in prokaryotes and eukaryotes.

2.4: Translation:

a) Genetic code: Properties, features and 'Wobble hypothesis',
b) Structure and chemical composition of prokaryotic and eukaryotic ribosome.
c) Aminoacylation of t-RNA, Activation of t-RNA, Recognition of t-RNA,
d) Translation in prokaryotes. Initiation of protein synthesis, chain elongation and chain termination.
e) Transduction in eukaryotes

15

Unit-3: Genetics:

3.1: Sex Determination

3.1.1 Methods of sex determination
Environmental, Chromosomal – Haploidy, XX-XO, XX-XY and ZW
Genic Balance Theory of Sex Determination in Drosophila. Lyons Hypothesis of X chromosome inactivation.

3.1.2 Inheritance related to Sex:
X-Linked, Y-linked and Z linked, with suitable examples.
Sex limited and Sex influenced Genes.

3.2 Multiple Alleles:
Concept, definition, characters and symbolism, coat colour in rabbit, eye colour and vestigial wing alleles in Drosophila, A and B blood group and Rh factor in human.

10

3.3 Quantitative or Polygenic Inheritance

Concept and definition. Skin colour, eye colour and height in human, milk gene in cow, meat gene in Poultry.

3.4 Linkage and Crossing Over

(a) Concept of linkage, coupling and repulsion hypothesis, linkage groups, complete and incomplete linkages.

(b) Concept of crossing over, cytological evidence of crossing over, mechanism and types of crossing over. Factors affecting crossing over and significance of crossing over

Unit-4: Biotechnology: 15

4.1 Tools in Recombinant DNA Technology

4.1.1: Molecular Tools:

a) Restriction Enzymes
b) DNA ligases

4.1.2: Cells and Organisms as Tools for Recombinant DNA Technology:

a) Requirements for growth of cells in culture-Brief idea
b) Properties and types of Vectors- plasmids (pBR 322), Bacteriophage and cosmid vectors.

4.1.3: Gene Libraries and Construction of gene library

a) Selection, screening and preparation of donor genetic material
1. DNA labeling and probe production
2. Obtaining intact c-DNA

b) Construction of donor DNA: cloning vector recombinant molecule
1. Direct insertion of donor DNA (gene) into vector through restriction homology.
2. Insertion of a gene into a plasmid by using Linker molecule, Adaptor molecule and Homopolymer tailing.

c) Insertion of recombinant molecule into host cell (cloning strategy)
1. Cloning in bacterial cell (Somatostatin gene insertion)
2. Cloning in animal cell (Interferon gene insertion)

Unit-5: Commercial Biotechnology and Bioinformatics: 15

5.1 Applied Biotechnology:

Applications of biotechnology in

a) Agriculture- Golden rice, Herbicide resistance, Nitrogen fixation, Bt toxin

b) Therapeutics: Hepatitis B vaccine, Stem cell therapy

c) Environment: Use of microbes in bioremediation of heavy metals and plastics

5.2: **Bioinformatics:**

a. Introduction and scope

b. Concept of information network: Internet, IP address, TCP/IP, FTP, HTTP, HTML, and URLs

c. Genomics: DNA sequencing by Sanger's Method
Genome projects

d. Introduction to Human Genome Project

e. Introduction to proteomics: Protein conformation. Protein sequencing and analysis. DNA alphabet. Extended DNA alphabet (IUB-IUPAC). Base ambiguity symbols. Single letter amino acid code. Pattern recognition and prediction. Homologous, Analogous, orthologous and paralogous sequences.

f. Virtual libraries (Concept of database and application): The European Molecular Biology Net work-EMBnet, The National Center for Biotechnology – NCBI

6.2.1 Genetic Basis of Evolution:
Reproduction, Significance of Meiosis
Population Genetics: Gene Pool, Gene Frequencies,
Hardy-Weinberg equilibrium

6.2.2 Variations as Raw Material for Evolution
Types of Variations, Mutation and Recombination

6.2.3 Elemental forces of Evolution:
Migration (Gene Flow), Mutation, Natural selection and Genetic Drift

6.2.4 Speciation:
Allopatric and Sympatric speciation
Isolating Mechanisms: Types of Isolation
6.2.5 Concept of Macro and Mega evolution

Practical II

1. Study of pH meter –Principle and working (Demonstration)
2. Preparation of buffers of different pH using Henderson-Hasselbalch equation.
3. Preparation of titration curve using strong acid and strong base with the help of pH meter
4. Determination of pKa of weak acid.
5. Study of colorimeter Principle and working
   i. selection of filter ii Determination of concentration
6. Study of osmosis using RBCs
7. Using electron micrographs ultra structure study of Mitochondria, Endoplasmic reticulum, Golgi complex, nucleus and lysosomes

8 Study of chromosome morphology using temporary squash preparation of onion root tip.
9. Study of polytene chromosome: Temporary preparation of salivary gland chromosome of Chironomous larva/ Drosophila/ Mosquito.
10. Study of Barr body.
11. Problem solving based on X-Linkage, Multiple Alleles, Multiple genes and Linkage.
12. Mimicry and warning colours (Specimens or Photographs).
13. Internet connectivity, search engines and visit to bioinformatics and other related sites.

14. Estimation of blood glucose using glucometer and using a glucose estimation kit (GOD POD method7
15. Problems solving using examples of restrictions enzymes recognition sites and resultant fragrance from DNA Sequence provided
16. Identification of genes and restriction sites on plasmid maps (pBR 322, pUC etc)

REFERENCE BOOKS:

1. Introduction to genetic engineering, Nicholl, Cambridge Press. Low priced Ed.
2. Biotechnology: Fundamentals and Application. 3rd Ed., Agrobios.
3. Principles of Gene Manipulation, Old and Primrose, Blackwell Sci. Pub. 5th Ed.
4. Genetic engineering by Old and Primrose. Cambridge Press. Low priced Ed.
5. Basic Biotechnology, Fr. Ignasimuthu, Tata McGraw Hill.
6. Principles of Biochemistry, Lehninger, Nelson and Cox, 2nd Ed. CBS publishers
7. General Biochemistry, J.H. Weil, Wiley Eastern Ltd
8. Molecular Biology of the Cell, 4th Ed. Bruce Alberts and Others. Garland Pub
9. Cell and Molecular Biology- Concepts and Experiments. Gerald Karp. John Wiley and Sons
10. Molecular Cell Biology, 3rd Ed. H. Lodish and others. Scientific American Books.
11. Cell Biology and Genetics, C. Starr & R. Taggart. Wadsworth Pub Co
12. Genetics – Winchester, Oxford IBH Pub.
13. Principles of Genetics – Sinnot. Dunn and Dobzhansky. McGraw Hill Pub
14. Genetics – Strickberger, Macmillan Pub.
15. Principles of Genetics – Tamarin. 7th Ed. Tata McGraw Hill
16. Genetics. D. J. Fairbanks and W. R. Anderson. Wadsworth Pub
17. Evolution- Strickberger, CBS publication.
18. Cells- Prescott, CBS publication.
19. Theory of Evolution, Smith, Cambridge Press. and Low priced Ed
20. Introduction to Bioinformatics. T. K. Attwood and D. J. Parry- Smith Pearson. Edu. Asia, Low Priced Ed.
21. Introduction to Bioinformatics, S. Sundara Rajan, R. Balaji. Himalaya Pub

Paper III :Applied and Economic Zoology

Unit: I Introduction to Parasitology and Protozoan Parasites 15

1. **Types of parasites and hosts**
   Parasites (Ectoparasites, Endoparasites, Monogenetic, Digenetic, Temporary, Permanent, Extracellular parasites, Intracellular, Facultative, Accidental)
   Hosts (Definitive, Intermediate, Paratenic, Reservoir)
2. **Protozoan parasites:**
   Morphology, mode of infection, life cycle, pathogenisity, prophylaxis and treatment of: *Entamoeba histolytica, Plasmodium vivax, Trypanosoma gambiense* and *Leishmania donovani*

Unit II: **Economic Entomology** 15

A] Honey-bee: Social life and communication, life history, Apiculture, economic importance.
B] Lac-Insect: life cycle, lac culture, composition and uses of lac
C] Silkmoth: Life history, sericulture, economic importance.
D] Life history and control measures of *Schistocera gregaria*, Aphids, *Sitophilus oryzae*, *Tribolium confusum*

E] Methods of insect control
   a. Chemical control by synthetic and natural chemicals
   b. Biological control by
      1] *Bacillus thuringiensis*
      2] Entomophagus insects
      3] Parasitic insects

Unit III : Animal Farming I

15

3.1 Introduction: concept of integrated farming
Present status and future of animal farming in India

3.2 Poultry:
Definition, nomenclature and breeds of fowl, factors affecting size of eggs, abnormal eggs, hatching of eggs, housing and equipment, brooding and rearing, raising broilers,
Poultry diseases- Coccidiosis, Avian flue

3.3 Goat farming
Importance of goat farming
Indigenous breeds- Jamanapari, Beetal, Bonberi, Black Bengal
Exotic breeds- Toggenberg, Nubia
Nutrition, Prevention and treatment of diseases.
Recent techniques to improve production.

Unit IV- Helminth parasitology

15

Morphology, mode of infection, life cycle, pathogenisity, prophylaxis and treatment of Helminthes:
Taenia solium,
Enterobius vermicularis,
Ancylostoma duodenale,
Wuchereria bancrofti and
Dracunculus medinensis

Unit V- Fisheries

15

1. Types of fisheries
(Marine: coastal, offshore and deep sea fisheries, Brackish water fisheries, Fresh water fisheries, Culture fisheries, with emphasis on locally important species)
2. Important capture fisheries of India

A] Fin-fish: Oil sardine, mackerel, Bombay duck, pomfret and shark
B] Crustacean fisheries: Prawns, crabs and Lobsters
C] Molluscan fisheries: Edible and pearl oyster, Process of pearl formation

3. Fish preservation
A] Principles of preservation
B] Methods of preservation
4. Fish products
5. Crafts and gears used on Indian coasts

A] Crafts : Dugout, Outrigger, Catamaran. Masula, Satpati. Trawler
B] Gears : Gill and drift net, dol net, cast net, purse seine, Shore seine. long line

Unit VI : Animal Farming II

15

1. Sheep farming
   A] Common terms in and advantages of sheep farming
   B] Various breeds of sheep: Indigenous- Chokla, Nial
   Exotic- Rambouillet, Dorset
   C] Preparing the ewe for breeding and system of mating.
   D] Controlling heat, sign of pregnancy. lambing, raising lambs.
   E] Feeding of ewe flock.
   F] Determining the age of sheep by their teeth.

2. Cattle Farming
   Classification of breeds- milch breeds. dual purpose breeds. draught breeds new breeds
   Various breeds of cows:
   Indigenous- Red sindhi. Sahiwal Khillari Jercy , Hariyana
   Exotic- Holstein-Friesian. Brown Swiss
   Various breeds of Buffalo:
   Murrah Nagpuri, Jaffrabadi, Bhadwari
   Breeding and management of buffaloes

3. Dairy science Composition of milk, methods of preservation milk products

4. Poultry

Practicals for paper III

1. Parasitology:

Types – Identification of Entamoeba, Plasmodium, Trypanosoma, Leishmania, Taenia, Fasciolobius, Ancylostoma, Wuchereria and Dracunculus.

Parasitic adaptations – Scolex and mature proglottid of tapeworm.

2. Entomology:

Honey bee – Life History: Bee hive, mounting of: mouth parts, sting apparatus and legs.

Silk moth: Life history

Harmful insects- locust/grass hopper, aphid, rice weevil, flour beetle

Entomophogus insect – Dragon fly

Parasitic insect – Ichneumon wasp

3. Fisheries: Identification of the specimens with special reference to fishery

Rohu, Catla, Mrigal, Oil sardine, Mackeral, Bombay duck, Pomfret, Shark, Prawn/shrimp

Lobster, Crab, Edible oyster, Pear oyster, Sepia, Loligo, Katelysia, Mytilus

Identification and uses of:

[illegible] Catamaran, Masula, Satpati, Trawler

[illegible] purse seine, rampani net, long line

4. Animal Husbandry: Study of the following

Poultry - [illegible] Broiler

Cattle - [illegible] Sahiwal

[illegible] Hariyana

[illegible] Khillari

Goat - [illegible]

Sheep - [illegible]

Buffalo - [illegible]

5. Preparation of paneer from milk.

6. Colorimetric estimation of protein in two different varieties of hen eggs (Country/Farm) – Biuret or Folin – Lowry method (Std. graph to be provided)

7. Colorimetric estimation of total lipids in the yolk of two different varieties of eggs (Country/Farm) – $FeCl_3$ method. (Std. graph to be provided)

8. To find adulterams in the milk (Strach and Urea)

9. Colorimetric estimation of total fat in the milk of different varieties – $FeCl_3$ method. Std. graph to be provided)

10. Extraction of Casein from milk and its Qualitative test

11. To measure the density of milk by Lactometry.

References Books

1) Parasitology – K. D. Chatterjee

Chatterjee Medical Publication, Kolkata

2) Medical Paracytology – M. C. Dey and T. K. Dey

Allied agency, Kolkata

3) Animal Parasitism – Clark P. R.

Prentice Hall of India, New Delhi

4) Handbook of Economic Zoology - Jawaid A. and Sinha S. P.

S. Chand and Co., New Delhi

5) Destructive and Useful Insects – C. L. Metcalf and V. P. Flint

Tata Mc Graw Hill, New Delhi

6) Fish and Fisheries in India – Jhingram V. G.

Hindustan Publishing Corpn., New Delhi

7) Marine Fisheries – D. V. Bal and K. V. Rao

Tata Mc Graw Hill, New Delhi

8) Live Stock and Poultry Production – Harbans Singh and Earl N. More

Prentice Hall of India, New Delhi

9) A. Text Book of Animal Husbandry – G. C. Banerjee

Oxford and IBH Publishing Co.

10) Economic Zoology – G. S. Shukla and V. B. Upadhay

Rastogi Publications, Shivaji Road, Meerut 250002, India

11)A Handbook on Animal Husbandry ICAR Publication

12) Crafts and gear of India Y. Shrikrishnan & Lata Shenoy, ICAR Publication

EXAMINATION SCHEME

The scheme of examination for the revised course in Zoology at S.Y. B.Sc. examination will be as follows

Theory	Title	Examination	Maximum marks	Maximum Marks after Conversion
Paper I	Animal Kingdom Developmental Biology and Cellular organization	First Term	60	30
	Ecology & Ethology	Second Term	60	30
Paper II	Biochemistry,	First Term	60	30
	Molecular Biology, Biotechnology , Bioinformatics , Genetic and Evolution	Second Term	60	30
Paper III	Applied and Economic Zoology	First Term	60	30
		Second Term	60	30
Practical I			40	
Practical II			40	
Practical III			40	
Total Marks	Theory			180
	Practical			120
		Total Marks		300

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