

**UNIVERSITY OF MUMBAI**



**Revised Syllabus for**

**S.Y.B.Sc. (Zoology)**

**(Effective from the Academic year 2003 – 2004)**

# UNIVERSITY OF MUMBAI

## **Revised Syllabus of S. Y.B.Sc. Zoology**

**(Effective from the Academic year 2003-2004)**

### **Preamble**

Present syllabus of the S. Y. B. Sc. Zoology came into force from the academic year 1996-97. Since then, many developments have taken place in the subject and a need was felt by the Board members that students opting for 2 units Zoology at S. Y. B. Sc level should also get exposure to modern Zoology, specially Biotechnology and Bioinformatics and its applications. Keeping that in view the Board of Studies in Zoology during its meeting held on 26th March 2002 decided to form a syllabus committee consisting of some board members and some co-opted members for revision of the S. Y. B. Sc. syllabus. The committee held several meetings and prepared a draft syllabus. The Chairman, Board of Studies in Zoology called a meeting of the syllabus committee on 12<sup>th</sup> Nov 2002 to discuss the draft syllabus. Suggestions were noted and further during the meeting of the Board of Studies in Zoology held on 14<sup>th</sup> Nov 2002 at the University of Mumbai and necessary changes have been incorporated in the syllabus, As decided in the Academic Council meeting held on 7th Oct 2002, to introduce three subjects with 2 units each from the academic year 2003-04 at the S. Y. B. Sc. level as per UGC norms, the new syllabus has been prepared accordingly for the 2 units course. It was resolved that the revised syllabus of S. Y. B. Sc. Zoology (2Units) be made effective from the academic year 2003-2004.

Hence the Board of Studies in Zoology presents this revised syllabus of the S.Y.B.Sc. Zoology (2 units) and recommends that the same be introduced from the academic year 2003-2004.

14th Nov 2002

Chairman  
Board of Studies in Zoology

# Revised Syllabus of S. Y.B.Sc. Zoology to be introduced from the Academic year 2003-04

## Distribution of topics and lectures

| PAPER | UNIT | TOPICS   | NO. OF LECTURES |
|-------|------|--|-----------------|
| I     | 1    | Wonders of animal kingdom                        | 30              |
|       | 2    | Developmental Biology<br>& Cellular organization | 30              |
|       | 3    | Ecology and Ethology                             | 30              |
| II    | 1    | Biochemistry, Molecular biology                  | 30              |
|       | 2    | Biotechnology, Bioinformatics                    | 30              |
|       | 3    | Genetics & Evolution                             | 30              |

### Note:

1. Two short field excursions for habitat studies are compulsory.
  2. Fieldwork of not less than eight hours duration is equivalent to one period per week for a batch of 15 students.
  3. No topic from the syllabus should be assigned as project work/seminar.
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# **Revised syllabus of S. Y. .B. Sc. Zoology to be introduced from the Academic Year 2003-2004**

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## **PAPER I: Animal Kingdom, Developmental biology and Cellular organization, Ecology and Ethology.**

### **UNIT 1: WONDERS OF ANIMAL KINGDOM (30)**

#### **1.1. Unicellular, Multicellular and Acoelomate life (8)**

- 1.1.1. Protozoa: Skeleton & Reproduction
- 1.1.2. Porifera: Canal system, spicules and reproduction
- 1.1.3. Coelenterata: Polymorphism, Coral types and theories of formation of coral reefs
- 1.1.4. Helminthes: Reproduction in platyhelminthes and parasitic adaptation in helminthes.

#### **1.2. Coelomate life. (9)**

- 1.2.1. Annelida: Reproduction
- 1.2.2. Arthropoda:, Crustacean larvae, Mouth-parts of insects and Metamorphosis in insects
- 1.2.3. Mollusca: Shell. Foot and Torsion
- 1.2.4. Echinodermata: Water vascular system and Larvae

#### **1.3. Retrogression (1)**

- 1.3.1. Retrogressive metamorphosis in Ascidians

#### **4. Vertebrate life (12)**

- 1.4.1. Swim bladder, B reeding and Parental care in Pisces
- 1.4.2. Neoteny and Parental care in Amphibia
- 1.4.3. Diversity and Adaptive radiation in ruling reptiles
- 1.4.4. Poison aparatus and venomous and non-venomous in snakes
- 1.4.5. Migration m birds
- 1.4.6. Egg laying mammals and marsupials
- 1.4.7. Aquatic mammals

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## **UNIT -2: DEVELOPMENTAL BIOLOGY AND CELLULAR ORGANIZATION (30)**

### **2.1. DEVELOPMENTAL BIOLOGY (15)**

- 2.1.1. Fertilization and parthenogenesis (5)
- 2.1.2. Eggs and cleavages: (3)

- a. Types of eggs
- b. Laws of cleavage and types of cleavage
- 2.1.3. Types of blastulae (1)  
Ex. Amphioxus, Frog, Bird and Mammal
- 2.1.4. Gastrulation (3)  
Epiboly and Emboly-Invagination, involution, infiltration
- 2.1.5. Mesodermalization and coelom formation (3)  
Mesodermalization: Schizocoelic (Annelids and birds)  
and Enterocoelic (Amphioxus and Amphibian)

## **2.2. CELLULAR ORGANIZATION (15)**

### **2.2.1. Structure and function of the Plasma membrane (3)**

Functions of membrane, Membrane composition: lipids, carbohydrates and proteins, Fluid mosaic model, Importance of membrane fluidity and asymmetry, Membrane transport: Permeability, Passive diffusion, Facilitated transport, Active transport: Na<sup>+</sup> - K<sup>+</sup> pump, movement of glucose across intestinal wall, Exocytosis and endocytosis

### **2.2.2. Cytoplasmic membrane systems: (Structure and function) (5)**

- A. Endoplasmic reticulum:** SER and RER functions- secretory cell, Membrane biosynthesis in ER, Glycosylation in RER, Retaining proteins in ER.
- B. Golgi complex:** The trip from ER to Golgi and through Golgi compartment, Targeting vesicles to a particular compartment, Targeting proteins of biosynthetic pathway, Glycosylation in Golgi complex, Exocytosis: The terminal stage of secretion
- C. Lysosomes:** Primary and secondary lysosomes.

### **2.2.3. Mitochondria (3)**

Structural organization, Chemical energy and ATP, Krebs's cycle. Electron transport and oxidative phosphorylation. Chemiosmotic theory, Biogenesis.

### **2.2.4. Structure of Nucleus and Nucleolus: (4)**

Nuclear pore and pore complex, Nuclear matrix, Nucleolus. Organization of DNA into chromosomes -Prokaryotic chromosome, Eukaryotic chromosome: Chromatin structure. Histones, Euchromatin and heterochromatin, Structure of nucleosome, Assembly of nucleosome. Solenoid structure. Polytene chromosomes and its significance Lampbrush chromosomes and its significance

## **UNIT --3: ECOLOGY AND ETHOLOGY (30)**

### **3.1. ECOLOGY (18)**

#### **3.1.1. Ecosystems (9)**

- a. Definition of ecosystem, Major and minor ecosystems
- b. Abiotic Factors: Edaphic, climatic, topographic, Biotic factors.
- c Types of ecosystems: Marine, freshwater and terrestrial.

#### **3.1.2. Biomes and Biodiversity**

##### **A. Biomes (6)**

Deserts, Grassland: Prairies and Savannas, Tundra, Coniferous forests, Deciduous and evergreen forests, Mediterranean/Chaparral/shrub, Tropical moist forests. Tropical seasonal forests.

##### **B. Biodiversity (3)**

Definition, Types of biodiversity and hot spots. Benefits from biodiversity, Threats to biodiversity Human impact on biodiversity. Measures to save biodiversity.

### **3.2. Ethology (Animal behaviour) (12)**

#### **3.2.1. Animal Instincts (6)**

The concept of instinct. The innate releasing mechanisms, The discovery of imprinting. Sensitive periods in learning. Long term aspects of imprinting. Imprinting as learning, Functional aspects of imprinting.

#### **3.2.2. Displacement activity (3)**

The causes of displacement activities, Attention and displacement activity, The concept of distinction, Functional aspects of displacement activity.

#### **3.2.3. Ritualization and communication (3)**

Ritualization. Conflict, Communication among species. Manipulation.

**Portion to be covered in the First term:**

**Unit 1: up to 1.2.4 (inclusive)**

**Unit 2: up to 2.1.5 (inclusive)**

**Unit 3: up to 3.1.2.A (inclusive)**

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**Portion to be covered in the Second term:**

**Unit 1: From 1.3 onward**

**Unit 2: From 2.2 onward**

**Unit 3: From 3.1.2. B onward**

## **PAPER -II: Biochemistry, Molecular biology, Biotechnology, Bioinformatics, Genetics and Evolution**

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### **UNIT-I: BIOCHEMISTRY AND MOLECULAR BIOLOGY (30)**

#### **1.1. CHEMICAL BONDS: (4)**

**1.1.1 Covalent bonds:** (a): Single, Coordinate, Multiple, Polar and Non-polar bonds.

(b): Peptide, disulfide and glycosidic bonds.

**1.1.2. Non-covalent bonds:** Ionic or electrostatic, hydrogen bond, Hydrophobic interactions, van der Waal's interactions.

#### **1.2. WATER. THE BASIC MOLECULE OF LIFE (7)**

**1.2.1.** Molecular structure of water: Tetrahedral geometry  
Hydrogen bond and flickering cluster, Macromolecular association.

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

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

#### **1.3. METABOLISM: (3)**

An overview of metabolism. Intermediary metabolism, How major anabolic and catabolic pathways are interconnected. Main possibilities of interconversion, Acetyl CoA as a common product in metabolism of carbohydrates, proteins and lipids.

#### **1.4. EXPRESSION OF GENETIC INFORMATION (16)**

1.4. 1 Transcription in Prokaryotes Initiation, elongation, termination

of mRNA, E.coli RNA polymerase.

1.4.2. Transcription in Eukaryotes: RNA polymerase, ofe ukaryotcs,  
Differences in features of transcription in prokaryotes and eukaryotes.

1.4.3. Translation:

- a). Genetic code: Properties, features and Wobble hypothesis,
- b). Structure and chemical composition of prokaryotic and eukaryotic ribosomes.
- c). Arninoacylation of tRNA, Activation of tRNA, Recognition of tRNA,
- d). Translation. in prokaryotes: Initiation. of protein synthesis, chain elongation and chain termination.
- e). Types of post translational modifications.
- f). Differences between translation in prokaryotes and eukaryotes.

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## **UNIT -2: BIOTECHNOLOGY AND BIOINFORMATICS. (30)**

### **2.1. BIOTECBNOLOGY: (20)**

#### **2.1.1. Requirements for growth of living cells in culture (4)**

- a). Essential nutrients and environmental variables:  
pH, Oxygen, ionic concentration
- b). Culture media (solid and liquid), Enrichment and selective media  
Indicator media, preparing media
- c). Aseptic techniques: (i) Pouring plates and  
(ii) Methods of inoculation

#### **2.1.2. Basic techniques in recombinant DNA technology (12)**

- A. Restriction enzymes
- B. Properties of cloning vectors
- C. Plasrnids as cloning vector: example pBR322
- D. Bacteriophage and cosmid vectors
- E. Construction of a gene library
  - a) Sdetection, screening and preparation of donor genetic material
    1. DNA labeling and probe production
    2. Obtaining intact cDNA
  - b) Construction of donor DNA-cloning vector recombinant molecule
    - 1 Direct insection 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 strategies):
1. Cloning in bacterial cell (Somatostatin gene insertion)
  2. Cloning in animal cell (Interferon gene insertion)

d) Growth and selection of transformed cells

**2.1.3. Application of genetically engineered bacteria: (2)**

In agriculture: Nitrogen fixation, Herbicide resistance,  
Pesticide -Bacillus thuringiensis toxin,  
In therapeutics: Production of human insulin.

**2.1.4. Application of genetically engineered animal cells: (2)**

Hepatitis Vaccines (Hepatitis B virus surface antigen)  
Human tissue plasminogen activator.

**2.2. BIO-INFORMATICS: (10)**

a. Introduction to bio-informatics.

b. Scope of bioinformatics.

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

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

e. 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 their use):  
The European Molecular Biology Network-EMBNET  
The National Center for Biotechnology Information-NCBI.

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# UNIT-3: GENETICS AND EVOLUTION:

## 3.1. GENETICS (18)

### 3.1.1. Sex determination: (5)

Environmental, Chromosomal-Haploidy, XX-XO, XX-XY, and ZW method, SRY and DAXI gene in sex determination in humans.  
Genic balance theory of sex determination in Drosophila  
Lyons hypothesis of X chromosome inactivation  
Freemartin cattle and Crew hen

### 3.1.2. Inheritance related to sex: (2)

Sex-linked, X-linked, Y-linked and Z-linked inheritance in Humans, Drosophila and Birds.  
Sex limited and Sex influenced genes .

### 3.1.3. Multiple alleles: (2)

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

### 3.1.4. Quantitative or polygenic inheritance: (2)

Skin colour, eye colour and height in humans  
Coat colour spotting in cow, mice, milk gene in cow, meat gene in poultry.

### 3.1.5. Linkage, Crossing over and Gene mapping: (7)

- a. **Linkage:** Concept of linkage, Coupling and repulsion hypothesis, Chromosome theory of linkage and arrangement of linked genes, Linkage groups, Complete and incomplete linkages
- b. **Crossing over:** Concept, cytological evidence of crossing over, mechanism and types of crossing over, factors affecting crossing over, Significance of crossing over.
- c. **Chromosome mapping:** Concept, Procedure, Factors affecting chromosome mapping, Interference and coincidence

## 3.2. EVOLUTION (Neo-Darwinism) (12)

### 3.2.1. Genetic basis of evolution:

Reproduction: Significance of meiosis  
Population genetics: Gene pool, Gene frequencies, Hardy-Weinberg equilibrium.

### 3.2.2. Genetic basis of Inbreeding and heterosis

### 3.2.3. Variation as raw material for evolution:

Types of variation, Mutation and recombinations.

### 3.2.4. Elemental forces of evolution:

Migration (gene flow), mutation, natural selection and genetic drift

- 3.2.5. Speciation: Definition of species,  
Allopatric and sympatric speciation. interspecific and  
intraspecific speciation,  
Isolating mechanisms: Types of isolation
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**Portion to be covered in the First term:**

**Unit 1: up to 1.3 (inclusive)**

**Unit 2: up to 2.1.2.D (inclusive) and 2.2.a to 2.2.d (inclusive)**

**Unit 3: up to 3.1.3 (inclusive) and 3.2.2 (inclusive)**

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**Portion to be covered in the Second term**

**Unit 1: From 1.4 onward**

**Unit 2: From 2.1.2.E to 2.1.4. and 2.2.e and 2.2.f**

**Unit 3: From 3.1.4 and 3.2.3 onward**

## **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, Obelia medusa, Physalia, Velella, Porpita.
5. Observation of types of corals: Fungia, Madrepora, Meandrina (brain coral), Tubipora, Sea fan.
6. Observation of T. S. of liver fluke, Liver fluke larvae. scolex of tapeworm. cysticercus. mature proglottid.
7. Observation of Heteronereis and trochophore larva.
8. Study of crustacean larvae: Nauplius, Cypris, Zoea, Megalopa, Alima, Mysis, and Phyllosoma.
9. Mouth parts of insects (Mountings): Cockroach, Housefly  
Study of permanent slides: Mouth parts of Bedbug, Mosquito, Butterfly, Honey bee, Tick.
10. Study of metamorphosis of insects:
  - i) Juvenile and adult of Lepisma.
  - ii) Different stages in the life history of Cockroach, Housefly, Mosquito (Culex or Anopheles).
  - iii) Types of insect larvae (Apodous, Oligopodous and Polypodous): Campodiform. Carabiform. Eruciform, Pliatyform, Scarabiform, Vermiform, Elateriform.
  - iv) Types of insect pupae: Decticus, Adepticus, Exarate, Obtect, Coarctate
11. Study of foot in molluscs: Chiton, Patella, Aplysia, Mytilus, Solen, Cardium, Sepia
12. Study of shells in molluscs: Chiton, Centalium, Trochus, Placuna, Solen.

- Internal shell of Sepia, Shell of Nautilus, Sinistral and dextral shells.
13. Study of Echinoderm larvae: Bipinnaria, Ophiopluteus, Echinopluteus, Auricularia. Doliolaria.
  14. Study of Ascidian tadpole (retrogressive metamorphosis).
  15. Swim bladder in-situ (Rohu)
  16. Study of following organisms with reference to breeding and parental care: Seahorse, Gouramy, Siamese fighter, Catfish, Tilapia, Caecilian, Midwife toad (if specimens depicting the nests and clutches of eggs are not available, pictures should be displayed), Neoteny: Axolotl larva.
  17. Adaptive radiation in Reptiles (Specimens or photographs): Turtle, Tortoise, Chameleon, Phrynosoma, Wall lizard, Rat snake, Sea snake, Crocodile or Gharial.
  18. Venomous snakes: (specimens or photographs) Identification Key, Krait, Cobra, Russels's viper, Sawscaled viper, Jaw of any venomous snake to show the fangs and poison apparatus (Specimen or Photograph).
  19. Mammals: (Specimens or Photographs): Duck billed platypus, Kangaroo, Pangolin, Bottle nose dolphin, Blue whale, Sea-cow. .
  20. Study of different types of eggs: Isolecithal (Homolecithal)-Amphioxus or Mammal, Mesolecithal-Frog or fish or mollusc, Discoidal or Highly telolecithal-hens egg
  21. Study of different types of blastulae: Amphioxus, Frog, Mammal.
  22. Study of gastrulae-Frog. Primitive streak and section passing through primitive streak of chick embryo.
  23. Quantitative estimation of DO of water.
  24. Quantitative estimation of biochemical oxygen demand in water (1 hr. BOD).
  25. Quantitative estimation of free carbon dioxide in water.
  26. Quantitative estimation of salinity of water-Argento metric method.
  27. Determination of total hardness of water.
  28. To investigate the water content of soil.
  29. To investigate the organic content of soil.
  30. To investigate pH of soil.

## **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. Study of effect of lipid solubility of PM of RBCs-(0.8M methanol, ethanol, and propanol).
8. Study of ultra structure from electron micrographs of Mitochondria, ER. Golgi complex, Nucleus, Lysosomes.
9. Study of chromosome morphology using temporary squash preparation of onion root tip.

10. Study of polytene chromosome: Temporary squash preparation of salivary gland chromosome of larva of Chironomous/Drosophila/Mosquito.
11. Mimicry and warning colours (Specimens or photographs)
12. Demonstration of pouring plates, slants, butt preparation.
13. Demonstration of different methods of streaking.
14. Problems based on biotechnology and bioinformatics.
15. Study of Barr body from buccal epithelium
16. Problems in Genetics with reference to: X-linkage, Multiple alleles, Multiple genes, and linkage.

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# **S.Y.B.Sc. Zoology - Paper III .**

## **(Applied and Economic Zoology)**

**[Revised Syllabus -Effective from the  
academic year 2003-2004]**

### **Distribution of Topics and Lectures**

#### **Paper III**

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| <b>Unit</b> | <b>Topics</b>                                  | <b>No. of Lectures</b> |
|-------------|--|------------------------|
| <b>I</b>    | <b>Medical Parasitology</b>                    | <b>30</b>              |
| <b>II</b>   | <b>Economic Entomology &amp;<br/>Fisheries</b> | <b>30</b>              |
| <b>III</b>  | <b>Animal Husbandry</b>                        | <b>30</b>              |

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**Note: Students should visit at least one Institution/Industry with reference to applied & economic Zoology**

# Paper III- Applied and Economic Zoology

## Unit-I Medical Parasitology (30)

- 1.1 Introduction: Common terms, definitions (2)
- 1.2 Life Cycle, Mode of infection, Pathogenesis, Treatment, Control measures and host-parasite inter relationship (Molecular, Cellular basis included)
- i. Protozoa: Entamoeba histolytica, Plasmodium vivax, Trypanosoma gambiense, Leishmania donovani. (14)
- ii. Helminthes: Taenia solium, Ascaris lumbricoides, Ancylostoma duodenale, Wuchereria bancrofti (14)

## Unit-II Economic Entomology & Fisheries (30)

- 2.1 **Economic Entomology** (15)
- 2.1.1 a. Honey-bee: Social life & Communication,. Life history, Apiculture,Economic Importance of Honey bee.
- b. Lac Insect: Life cycle, Lac culture, composition and uses of Lac
- c. Termite: social Life, Termitarium, Termite control
- d. Life history & Control measures of: Schistocerca gregaria, Aphids, Sitophilus oryzae, Tribolium.
- 2.1.2 **Methods of Insect Control**
- a. History of Insecticides
- b. Chemical Control:
- i. Chlorinated hydrocarbon
- ii. Organophosphorus
- iii. Pyrethrins
- c. Biological Control:
- i. Bacillus thuringiensis
- ii. Entomophagus insects
- iii. Parasitic insects
- iv. Insect pathogens
- d. Economical hazards of insecticides.

|  |             |
|--|-------------|
| <b>2.2 Fisheries</b>   | <b>(15)</b> |
| <b>2.2.1. Types of Fisheries (in brief)</b>  | <b>(2)</b>  |
| a. Marine Fisheries: Coastal, offshore and deep sea fisheries  |             |
| b. Brackish water fisheries  |             |
| c. Fresh water fisheries   |             |
| d. Capture and culture fisheries   |             |
| <b>2.2.2 Important capture fisheries of India</b>  | <b>(7)</b>  |
| a. Fin fish: Oil sardine, Mackerel, Bombay duck, Pomfret, Sharks.  |             |
| b. Crustacean fisheries: Prawns, Lobsters & Crabs  |             |
| c. Molluscan fisheries: Edible and pearl oyster, squids, clams and mussels   |             |
| <b>2.2.3 Fish preservation</b>   | <b>(2)</b>  |
| a. Principles of preservation  |             |
| b. Methods of preservation   |             |
| <b>2.2.4      2.2.3 Fish Products</b>  | <b>(1)</b>  |
| <b>2.2.5 Crafts and gears used on east and west coast of India</b>   | <b>(3)</b>  |
| a. Crafts: Dugout, Outrigger, Catamaran, Masula, Satpati, Trawler  |             |
| b. Gears: Gill and driftnet, dol net, cast net, purse seine and shore seine, longline  |             |
| <b>Unit-III Animal Husbandry</b>   | <b>(30)</b> |
| <b>3.1      Taxonomy, domestication and animal husbandry in India</b>  | <b>(2)</b>  |
| Definition of animal husbandry, taxonomy, zoological classification of domestic animals, non-ruminants and ruminants, beginning of animal husbandry in India -present and future |             |
| <b>3.2      Poultry:</b>   | <b>(5)</b>  |
| Definition, Nomenclature and breeds of fowl (brief)  |             |
| Factors affecting egg size; abnormal eggs, selection and improvement, hatching of eggs, brooding and rearing, housing and equipment, raising of broilers.                        |             |
| <b>3.3      Piggery:</b>   | <b>(4)</b>  |
| a. Introduction and scope of swine farming in India, census, breeds and distribution of swine.   |             |
| b. Management of breeding and pregnant sows, care and management of sows during farrowing and after farrowing  |             |
| c. Care and management of piglets and growing stock, lactating sows, feedlot and feedlot stock.  |             |
| d. Selection and breeding technique in swine management for optimal production of swine feeds and housing of swine   |             |
| e. Vaccination, diseases detection and parasitic control in swine, slaughter and preservation of swine products, marketing of different pig products in India and abroad.        |             |

- 3.4 Goat Farming: (4)**
- Importance of goat and its utility to humankind
  - Indian breeds of goat (brief account)
  - Fodder production system for profitable goat production
  - Nutrition and feeding of goats
  - Goat production and embryo transfer
  - Recent reproductive technique to improve goat production
  - Goat diseases and their prevention, vaccination schedule in goat farm, preventive health scheme for goat
- 3.5 Sheep Farming (4)**
- Some common terms in relation to sheep
  - Advantage of sheep farming
  - Various breeds of sheep (brief account)
  - Preparing the ewe for breeding
  - System of mating
  - Controlling heat, sign of pregnancy, lambing, raising lambs
  - Feeding of ewe flock
  - Determining the age of sheep by their teeth
- 3.6 Important cattle breeds and their characteristics (4)**  
 Zoological classification, breeds, species, brief account of cattle breeds in India, classification of Indian breeds of cattle- milch breeds, dual purpose breeds, draught breeds, new breeds, characteristics of important foreign breeds.
- 3.7 Buffalo Farming (4)**
- Common terms in relation to buffalo
  - Breeds of Indian buffaloes (in brief)
  - Breeding and management of buffaloes
- 3.8 Dairy Science -Brief Introduction (2)**
- 3.9 Ethical aspects in animal husbandary (1)**

**NOTE: Topics to be covered in First Term**

**Unit 1 – 1.1 to 1.2.i**

**Unit 2 – 2.1**

**Unit 3 – 3.1 to 3.4**

**Topics to be covered in Second Term**

**Unit 1 -1.2.ii**

**Unit 2 – 2.2**

**Unit 3 -3.5 to 3.9**

## PRACTICAL III

### Parasitology:

Types -Identification of : Entamoeba, Plasmodium, Trypanosoma, Leishmania, Taenia whole specimen, Ascaris, Ancylostoma, Wuchereria.

Parasitic adaptation -scolex of tapeworm, mature proglottid of tapeworm, T.S. of Ascaris.

### Entomology:

Honey bee- Life history, mounting of: mouth part, sting apparatus and legs. Bee hive.

Lac

Termite: different caste, locust/ Grass hopper, Aphid, Rice weevil, Flour beetle

Entomophagous insect -Dragon fly

Parasitic insect -Ichneumon wasp .

### Fisheries:

Rohu, Catla, Mrigal

Oil sardine, Mackerel, Bombay duck, Pomfret, Sillark, Prawn, Lobster, Crab,

Edible oyster! Pear oyster, Sepia, Loligo, Katelaysia, Mytilus, Dried bombil, Salted mackerel

Crafts-Dugout, Outrigger, Catamaran, Masula, Satpati, Trawler

Gears- Gill net, dol net, cast net, purse seine, ramp ani net, long line.

### Animal Husbandry:

|                |                            |
|----------------|----------------------------|
| Poultry        | -Layer (Leg horn), Broiler |
| Cattle         | -Milch breed -Sahiwal      |
| Dual purpose   | -Hariyana                  |
| Daught purpose | -Malyi                     |
| Goat           | -Jamunapari, Surti         |
| Sheep          | -Gaddi, Marwari            |
| Buffalo        | -Murrah, Zaffarabadi       |

### Paneer making

Colorimetric estimation of protein in two different varieties of eggs

(Country/Farm)- Biuret or Folin-Lowry method. (Std: graph to be provided)

Colorimetric estimation of total lipids in the yolk of two different varieties of eggs

(Country/Farm)-FeCl<sub>3</sub> method. (Std. graph to be provided)

To find adulterants in the milk (Starch and Urea)

Colorimetric estimation of total fat in the milk of different varieties -FeCl<sub>3</sub> method. (Std. graph to be provided)

Extraction of Casein from milk and its Qualitative test

To measure the density of milk by Lactometry.

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