

Savitribai Phule Pune University

Department of Zoology

Format of Question paper for OEE (Zoology) 2026.

Section	No. of MCQs	Marks	Total Marks	Duration
Section A	10	20	100	120 minutes
Section B	40	80		

Syllabus for Online Entrance Examination (OEE) in Zoology for Admissions to M.Sc. Zoology at Department of Zoology, Savitribai Phule Pune University

Section A: This section will consist of 10 MCQs (2 marks each) of 20 marks based on the General Aptitude which is further divided into numerical ability, graphical analysis, quantitative comparison, data interpretation, reasoning, puzzles, general science etc.

Section B: This section will consist of 40 MCQs (2 marks each) of 80 marks based on the following syllabus of Zoology subject. The units and corresponding marks are as shown in the following chart.

Section B Syllabus

UNIT	No. of Questions (Total 40)	Marks (Total 80)
Unit 1: Biochemistry and Cell Biology	5	10
Unit 2: Genetics and Molecular Biology	5	10
Unit 3: Animal Physiology and Developmental Biology	5	10
Unit 4: Parasitology and Toxicology	5	10
Unit 5: Tools and Techniques and Histology	5	10
Unit 6: Animal Systematics and Diversity	5	10
Unit 7: Ecology and Evolution	5	10
Unit 8: Applied Zoology	5	10

Detailed Syllabus (Based on B.Sc. Zoology)

Unit 1: Biochemistry and Cell Biology

BIOCHEMISTRY

1. Basic Biochemistry:
 - 1.1 Bonds –Types: Ionic, covalent, noncovalent bonds (hydrogen, hydrophobic, electrostatic, Van der Waal forces) and their functions in bio molecules
 - 1.2 Structure of water molecule (liquid, ice and colloid)
 - 1.3 Physico-chemical properties of water
 - 1.4 Concept of acid and base, pH, Sorenson's scale, derivation of Henderson-Hasselbalch equation and its applications
 - 1.5 Concept of Buffer-types of buffer, buffering capacity and buffers in biological system (Phosphate, bicarbonate)
2. Carbohydrates:
 - 2.1 Definition and classification of carbohydrates
 - 2.2 Isomerism in carbohydrates- Structural and stereoisomerism
 - 2.3 Stereo chemical properties-enantiomers, anomers, epimerism, mutarotation, racemisation, biological significance and clinical significance-hypoglycemia and hyperglycemia
3. Proteins:
 - 3.1 Essential and non-essential amino acids
 - 3.2 Structure and classification of amino acids, Peptide bond, types of proteins, protein structures (primary, secondary, tertiary and quaternary structures with suitable example), bonds responsible for protein structures and Biological significance of proteins
4. Enzymes:
 - 4.1. Classification and properties of enzymes
 - 4.2 Regulatory and non-regulatory enzymes
 - 4.3 Enzyme kinetics, MM equation and its importance and LB plot
 - 4.4 Reversible and irreversible enzyme inhibition
 - 4.5 Factors influencing enzyme activity (pH, temperature, substrate concentration, enzyme concentration)
 - 4.6. Introduction of isoenzymes, allosteric enzymes, immobilized enzymes and ribozymes
 - 4.7. Clinical significance of enzymes- PKU and AKU
5. Lipids:
 - 5.1 Introduction, classification and chemistry
 - 5.2 Clinical significance (obesity, atherosclerosis, myocardial infarction)
 - 5.3 Biological significance of lipids

CELL BIOLOGY

1. Structure of prokaryotic and eukaryotic (Plant and Animal) cell
2. Structure and function of cell membrane:
 - 3.1 Chemical composition
 - 3.2 Fluid mosaic model
 - 3.3 Functions of plasma membrane
3. Composition of Cytoplasm

4. Study of following cell organelles with respect to structure and functions in brief:
 - 5.1 Endoplasmic reticulum
 - 5.2 Golgi complex
 - 5.3 Lysosomes, peroxisomes and glyoxysomes
 - 5.4 Ribosomes
 - 5.5 Mitochondria
5. Nucleus:
 - 6.1 Shape, size, number and position
 - 6.2 Ultrastructure of nuclear envelope and pore complex
 - 6.3 Functions
6. Cell division and their significance:
 - 7.1 Cell cycle in brief
 - 7.2 Mitosis
 - 7.3 Meiosis

Unit 2: Genetics and Molecular Biology

GENETICS AND MOLECULAR BIOLOGY

1. Linkage, crossing over and molecular basis of recombination
2. Gene Mutation
 - 2.1 Definition
 - 2.2 Types of mutations: spontaneous, induced, somatic, gametic, forward, reverse. Types of point mutation- deletion, insertion, substitution, transversion, transition
 - 2.3 Mutagenic agents.
 - a) UV radiation and ionising radiation
 - b) Base analogs, alkylating and intercalating agents
3. Population Genetics
 - 3.1 Basic Concepts in population genetics: Mendelian population, gene pool, gene frequency, chance mating (Panmictic mating)
 - 3.2 Hardy Weinberg law and its equilibrium
4. Molecular Biology
 - 4.1. DNA as genetic material- evidences (Griffith's, Avery et al and Hershey and Chase experiment), RNA as genetic material-TMV
 - 4.2. Chromatin-Heterochromatin, Euchromatin, histones, nucleosome arrangement, packaging of DNA
5. Central Dogma of Molecular Biology
 - 5.1. DNA Replication-Semiconservative (Messelson and Stahl experiment) Mechanisim in prokaryotes and eukaryotes
 - 5.2. Transcription- Transcriptional unit, RNA polymerase, transcription in prokaryotes and eukaryotes, post transcriptional modification (splicing- mRNA, modifications at 3' and 5' end)
 - 5.3. Translation-Genetic code, properties of genetic code, ribosome structure [prokaryotes and eukaryotes], protein synthesis–initiation, elongation, termination and concept of post translational modification (glycosylation)
6. Concept of operon - regulation of gene action, Lac operon, Trp operon
7. Recombinant DNA Technology- Introduction, restriction enzymes, cloning vector, PCR (polymerase chain reaction), DNA finger printing.

Unit 3: Animal Physiology and Developmental Biology

ANIMAL PHYSIOLOGY & DEVELOPMENTAL BIOLOGY

1. Introduction: Definition and scope
- 2 Nutrition:
 - 2.1 Concept of nutrition and energy requirements
 - 2.2 Physiology of digestion: digestive enzymes and their actions- salivary, gastric and intestinal digestion. Role of liver and pancreas in digestion
3. Circulation:
 - 3.1 Cardiac Cycle- systole, diastole and pacemakers
 - 3.2 Cardiac output and blood pressure
 - 3.3 Definitions and significance of electrocardiogram, colour doppler, angioplasty, angiography, angina pectoris, and coronary bypass
4. Respiration:
 - 4.1 Definition and types- Pulmonary and tissue respiration
 - 4.2 Mechanism of transport of gases
 - (a) Transport of Oxygen- Oxyhaemoglobin formation
 - (b) Transport of Carbon-dioxide
 - (c) Respiratory Quotient and BMR
5. Excretion:
 - 5.1 Physiology of Urine formation- ultrafiltration, reabsorption, tubular secretion
 - 5.2 Counter-Current Multiplier theory for urine concentration
 - 5.3 Role of ADH, and Renin angiotensin system
 - 5.4 Definitions and clinical significance of- renal failure, renal calculi, dialysis
6. Muscles:
 - 6.1 Ultrastructure of striated muscle
 - 6.2 Sliding filament theory of muscle contraction – physical and chemical changes
 - 6.3 Response of muscles to stimulation- simple muscle twitch, muscle fatigue and rigor mortis
7. Nervous Excitation:
 - 7.1 Origin and conduction of nerve impulse, saltatory conduction
 - 7.2 Synapse- ultrastructure and transmission of nerve impulse
 - 7.3 Definitions/concepts: impulse, stimulation, conduction, response, EEG, epilepsy

DEVELOPMENTAL BIOLOGY

1. Introduction:
 - 1.1 Definition and scope
 - 1.2 Theories of preformation, pangeneses, epigenesis, axial gradient and germ plasm
2. Concepts in Developmental Biology:

Growth, differentiation, dedifferentiation, cell determination, cell communication, morphogenesis, induction and regeneration
3. Gametogenesis:
 - 3.1 General aspects and origin of germ cells
 - 3.2 Sperm: general structure, mention variations with reference to Insect, Amphioxus, Frog, Bird and Human
 - 3.3 Ultra structure of typical sperm. (entire, T.S. through head, middle piece and tail)
 - 3.4 Spermatogenesis: phases & spermiogenesis (nuclear and cytoplasmic changes)

- 3.5 Oogenesis phases: growth phase- pre-vitellogenesis, vitellogenesis and post- vitellogenesis
- 3.6 Oocyte maturation: role of MPF (maturation promotion factor)
- 3.7 Ovum: general structure
- 3.8 Egg membranes: primary, secondary and tertiary
- 3.9 Types of eggs
- 4. Fertilization:
 - 4.1 Concept and types
 - 4.2 Attraction of gametes: sperm activation, chemotaxis (fertilizin and antifertilizin as enzymes and gamones as hormones)
 - 4.3 Sperm penetration: acrosome reaction, capacitation & decapacitation
 - 4.4 Activation of ovum: fertilization cone, polyspermy prevention: fast block (fertilization potential) & slow block (cortical reaction) & perivitelline space fertilization membrane
 - 4.5 Amphimixis
 - 4.6 Significance of fertilization
- 5. Cleavage
 - 5.1 Mechanism
 - 5.2 Planes and symmetry
 - 5.3 Patterns / Types
 - 5.4 Significance
- 6. Blastula: Definition and types
- 7. Gastrulation:
 - 7.1 Concept
 - 7.2 Basic cell movements in gastrulation: epiboly, emboly, convergence, invagination, ingression & involution (with reference to frog)
 - 7.3 Organizer: primary, secondary, tertiary
 - 7.4 Organogenesis: cell differentiation, tissue differentiation & organ formation up to rudimentary stage
- 8. Reproduction:
 - 8.1 Reproductive cycles with hormonal control- estrous and menstrual
 - 8.2 Hormonal control of pregnancy
 - 8.3 Hormonal control of parturition and lactation
 - 8.4 Hormonal control of male reproduction

Unit 4: Parasitology, Environmental Biology and Toxicology

PARASITOLOGY

- 1. Introduction: Scope and branches of Parasitology
 - Definition: host, parasite, vector, commensalisms, mutualism and parasitism
- 2. Types of parasites: ectoparasites, endoparasites and their subtypes
- 3. Types of hosts: intermediate and definitive, paratenic, reservoir
- 4. Host-Parasite relationship: Host specificity- definition, structural specificity, physiological specificity and ecological specificity
- 5. Study of the following parasites with reference to habit, habitat, Life cycle, Mode of Infection, pathogenicity and control measures - *Plasmodium vivax*, *Entamoeba histolytica*, *Ascaris lumbricoides* and *Taenia solium*

6. Study of the following parasites with reference to morphology, life cycle, pathogenicity and control measures: Head louse, Tick, Mite (*Sarcoptes scabiei*)
7. Parasitological significance of Zoonosis: Bird flu, Rabies and Toxoplasmosis
8. Control measures of arthropod vectors of human diseases: Malaria (*Anopheles stephensi*, *A. culicifacies*), Dengue, Haemorrhagic fever (*Aedes aegypti*, *A. albopictus*), Filariasis (*Culex pipiens fatigans*)

TOXICOLOGY

1. Toxicants and Toxicity:
 - 1.1 Definition of toxicology, scope and branches
 - 1.2 Types of toxicants
 - 1.3 Factors influencing toxicity (pH, temperature, reproductive status, age, physiological state)
 - 1.4 Dose, LD50, LC50
2. Toxicants of Public Health and Hazards:
 - Pesticides, heavy metals, fertilizers, food additives and radioactive substances.

Unit 5: Tools and Techniques and Histology

BIOLOGICAL TECHNIQUES

1. Introduction to biological techniques
 - 1.1 Solution/strengths of chemicals: percentage, normality, molarity, molality, osmolality, osmolality, ppm, ppb
 - 1.2 Separation techniques: principle and applications, techniques related to isolation, purification and characterization of bio molecules
 - 1.2.1 Chromatography (paper, ion-exchange), gel filtration
 - 1.2.2 Electrophoresis-(agarose, polyacrylamide)
 - 1.2.3 Ultracentrifugation
 - 1.2.4 Colorimetry and spectroscopy
2. Haematological Techniques:
 - 2.1 Blood cell count –Total count of RBCs, WBCs and Differential count of WBCs and their significance. Examination of bone marrow. Hb%, bleeding time, clotting time and their significance
 - 2.2 Microscopy: simple, compound, phase contrast, electron - their principle & working
 - 2.3 Micrometry
 - 2.4 Camera Lucida
3. Micro technique:
 - 3.1 Procurement of tissues and precautions to be taken to avoid tissue damage during procurement
 - 3.2 Fixatives: Classification of fixatives and importance of fixation of tissues
 - 3.3 Methods of fixation
 - 3.4 Dehydration, clearing, impregnation and block making:
 - 3.4.1 Clearing and alcoholising agents
 - 3.4.2 Clearing and dealcoholisation
 - 3.4.3 Impregnation and Embedding: Types of embedding media, methods of embedding and block making. Comments on hardening of paraffin
4. Microtomes and Knives:
 - 4.1 Types of microtomes
 - 4.2 Types of microtome knives

4.3 Section cutting: Microtomy- steps and precautions, common faults in section cutting- reasons & remedies. Mounting and spreading of ribbons

5. Stains and Staining

5.1 Classification of stains

5.2 Methods and types of staining

5.3 General procedure for staining of sections

5.4 Vital Stains

5.5 Mounting and labeling of sections: Classification of mounting media, refractive indices of mounting media

6. Histochemical staining:

6.1 Demonstration of Carbohydrates (PAS technique)

6.2 Demonstration of Nucleic acid (Feulgen Reaction).

HISTOLOGY

1. Introduction: Definition and scope

2. Tissues:

2.1 Definitions and review of tissues (location, structure and functions): epithelial, connective, nervous and muscular

3. Histological study of following organs

3.1 Skin (V.S.)

3.2 Tooth (V.S.)

3.3 Tongue (C.S.) with reference to mucosa papillae and taste buds

3.4 Alimentary canal: Basic histological organization with reference to: Oesophagus (T.S.), stomach (T.S.), duodenum (T.S.) Ileum (T.S.) and rectum (T.S.)

3.5 Glands associated with digestive system: Salivary glands – parotid (C.S.), submandibular (C.S.) sublingual (C.S.), liver

(C.S.) and pancreas (C.S.) including both exocrine and endocrine components

3.6 Respiratory organs: Trachea (T.S.) and lung (C.S.)

3.7 Blood vessels: Artery (T.S.), vein (T.S.) and capillaries (T.S.)

3.8 Kidney (L.S.), Structure of nephron and juxtaglomerular complex

3.9 Reproductive organs: a) Testis (T.S.) with reference to Seminiferous Tubules and cells of Leydig. b) Ovary (C.S.) - primary, secondary and matured (Graffian) follicle, corpus luteum and corpus albicans

4. Histology of endocrine glands:

4.1 Pituitary gland

4.2 Thyroid gland

4.3 Adrenal gland

Unit 6: Animal Systematics and Diversity

ANIMAL SYSTEMATICS AND DIVERSITY –I

1. Principles of classification:

1.1 Systematics-Linnaean hierarchy (Phylum, Class, Order, Family, Genus and Species)

1.2 Binomial nomenclature

1.3 Five kingdom classification system

2. Salient features and classification up to classes of the following: (any two examples from each class)

2.1 Protozoa

- 2.2 Porifera
- 2.3 Coelenterata
- 2.4 Platyhelminthes
- 2.5 Aschehelminthes
- 2.6 Annelida
- 3. Study of *Paramoecium*:
 - 3.1 Systematic position, Habit and habitat
 - 3.2 Structure, nutrition, excretion and reproduction (binary fission and conjugation)
- 4. Study of Earthworm:
 - 4.1 Systematic position, Habit and habitat
 - 4.2 External characters
 - 4.3 Digestive system
 - 4.4 Circulatory system
 - 4.5 Excretory system
 - 4.6 Reproductive system
 - 4.7 Nervous system and sense organs
 - 4.8 Economic importance

ANIMAL SYSTEMATICS AND DIVERSITY – II

- 1. Salient features and classification up to order with one example of the following:
 - 1.1 Hemichordata
 - 1.2 Urochordata
 - 1.3 Cephalochordata
- 2. Salient features of following classes with two examples of each
 - 2.1 Pisces- Cartilaginous and Bony fishes
 - 2.2 Amphibia- Apoda, Urodela and Anura
- 3. Study of Frog:
 - 3.1 Systematic position, Habit and habitat
 - 3.2 External characters and sexual dimorphism
 - 3.3 Digestive system, food, feeding and physiology of digestion
 - 3.4 Circulatory system (lymphatic system not expected)
 - 3.5 Central Nervous system
 - 3.6 Sense organs
 - 3.7 Reproductive systems (male & female)
- 4. General topics:
 - 4.1 Migration in fishes
 - 4.2 Neoteny in amphibian

ANIMAL SYSTEMATICS AND DIVERSITY –III

- 1. Salient features and classification up to classes of the following: (any two examples from each class):
 - 1.1 Arthropoda: Crustacea, Arachnida, Insecta, Myriapoda, Onychophora.
 - 1.2 Mollusca: Aplacophora, Gastropoda, Pelecypoda, Scaphopoda, Cephalopoda.
 - 1.3 Echinodermata: Asteroidea, Ophuroidea, Holothuria, Echinoidea, Crinoidea.
- 2. Study of following with reference to:
 - 2.1 Arthropoda: Mouthparts in Insects, Metamorphosis in Insects, Mimicry in Insects, Economic importance of Insects, Larval forms in Crustacea

- 2.2 Mollusca: Economic importance of molluscs, Shell and foot modification in molluscs, Torsion and Detorsion in molluscs, Larval forms in molluscs
- 2.3 Echinodermata: Origin of Echinodermata, Types of Pedicellariae, Larval forms in Echinodermata,
- 3. Study of Starfish:
 - 3.1 Systematic position, Habit and habitat
 - 3.2 External characters
 - 3.3 Digestive system
 - 3.4 Water vascular system
 - 3.5 Reproductive system
 - 3.6 Autotomy and regeneration.

ANIMAL SYSTEMATICS AND DIVERSITY – IV

- 1. Salient features of following classes and its subclasses with two examples of each:
 - 1.1 Reptilia
 - 1.2 Aves
 - 1.3 Mammalia
- 2. General topics:
 - 2.1 Poisonous and non-poisonous snakes (Two examples each)
 - 2.2 Desert adaptations in reptiles in brief.
 - 2.3 Beak and feet modifications in birds
 - 2.4 Migration in birds
 - 2.5 Aerial adaptations in birds
 - 2.6 Egg laying mammals
 - 2.7 Aquatic mammals
- 3. Study of *Scoliodon*:
 - 3.1 Systematic position, Habit and habitat
 - 3.2 External characters
 - 3.3 Digestive system, food, feeding and physiology of digestion
 - 3.4 Respiratory system
 - 3.5 Blood vascular system
 - 3.6 Nervous system and sense organs
 - 3.7 Male urinogenital system and female reproductive system.

ANIMAL SYSTEMATICS AND DIVERSITY – V

- 1. Study of *Pila globosa* with reference to the following:
 - 1.1 Systematic position, habit, habitat and external characters
 - 1.2 Body wall & pallial complex
 - 1.3 Functional anatomy: digestive, respiratory, circulatory, excretory, reproductive, nervous system & sense organs
- 2. Study of the following groups with reference to:
 - 2.1 Protozoa : locomotion & nutrition
 - 2.2 Porifera : skeleton and canal system
 - 2.3 Coelenterata : polymorphism and corals
 - 2.4 Hemichordata : affinities
- 3. Study of *Calotes versicolor* with reference to the following:
 - 3.1 Systematic position, habit, habitat and External characters

- 3.2 Functional Anatomy - Digestive, Circulatory, Excretory, Reproductive, Nervous system and Sense organs
- 4. Comparative study of following topics in vertebrates
 - 4.1 Integument: Skin of *Scoliodon*, Frog, *Calotes*, Pigeon & Rat
 - 4.2 Heart: Structure of heart of *Scoliodon*, Frog, *Calotes*, Pigeon & Rat
 - 4.3 Kidney: Evolution of Archinephros, Pronephros, Mesonephros, Metanephros
 - 4.4 Brain: Morphological variation in the different regions of the brain of *Scoliodon*, Frog, *Calotes*, Pigeon and Rat/Rabbit
- 5. Study of following groups with reference to
 - 5.1 Pisces: Dipnoi, Accessory respiratory organs, Electric organs
 - 5.2 Reptilia: Temporal vacuities, General characters of Rhyncocephalia
 - 5.3 Mammalia: Dentition in mammals

Unit 7: Ecology and Evolution

ECOLOGY

- 1. Environmental Biology
 - Introduction- Definition, basic concepts and scope
- 2. The Ecosystem
 - 2.1 Definition, abiotic and biotic components and their interrelationship
 - 2.2 Energy flow in ecosystem and flow models
 - 2.3 Major Ecosystems: (a) natural ecosystem: e.g. fresh water, forest (b) artificial ecosystem: e.g. cropland
 - 2.4 Food chain in ecosystem and food web
 - 2.5 Ecological pyramids
- 3. Environmental Pollution:
 - 3.1 Definition and types of pollution
 - 3.2 Pollutants, types of pollutants (metallic, gaseous, acids, alkalis, biocides)
 - 3.3 Air pollution: Definition, sources of air pollution and their effects
 - 3.4 Air pollution and its relevance with the following
 - 3.4.1 Acid rain
 - 3.4.2 Greenhouse effect
 - 3.4.3 Ozone layer depletion
 - 3.5 Water pollution: definition, sources of water pollution and their effects on ecosystem. Community waste with reference to following:
 - I. Sewage
 - II. Industrial wastes
 - III. Agricultural wastes
 - 3.6 Land / Soil pollution: definition, sources of land / soil pollution and their effects
 - 3.7 Noise pollution: definition, sources of noise pollution and their effects and control measures
- 4. Environment and Development
 - 4.1 Bioindicators and environmental monitoring
 - 4.2 Environmental challenges in India: land degradation, population explosion, urbanization and industrialization
- 5. Natural Resources and Conservation:

- 5.1 Renewable and non-renewable resources
- 5.2 Soil conservation
- 5.3 Forest conservation
- 5.4 Energy sources: conventional and non-conventional
- 6. Wildlife Management:
 - 6.1 Definition, causes of wildlife depletion
 - 6.2 Importance of wildlife management in India
 - 6.3 Endangered species, vulnerable species, rare species and threatened species
 - 6.4 Wild life conservation

EVOLUTION

- 1. Introduction.
 - 1.1 Origin of life
 - 1.2 Origin of eukaryotic cell (Origin of mitochondria, plastids & symbionts)
- 2. Evidences in favour of organic evolution:
 - Evidences from: anatomy, embryology, geographical distribution, palaeontology, physiology, biochemistry, genetics and molecular biology
- 3. Theories of organic evolution
 - 3.1 Lamarckism
 - 3.2 Darwinism and Neo Darwinism
 - 3.3 Mutation Theory
 - 3.4 Modern Synthetic theory
- 4. Isolation:
 - 4.1 Isolating mechanism
 - 4.2 Classification of isolating mechanism: Pre-zygotic and post-zygotic
- 5. Speciation:
 - 5.1 Types of speciation (Allopatric & Sympatric)
 - 5.2 Mechanism of speciation
 - 5.3 Patterns of speciation
 - 5.4 Factors influencing speciation
- 6. Animal Distribution:
 - 7.1 Methods of distribution
 - 7.2 Classification of animal distribution
 - 7.3 Patterns of animal distribution
 - 7.4 Factors affecting distribution
- 7. Antiquity of Man: Evolution of anthropoids including man (Kenya-pithecus to Homo sapiens)

Unit 8: Applied Zoology

1. Fishery

- 1.1 An introduction to fisheries and its types (in brief): Freshwater fisheries, Marine fisheries, Brackish water fisheries.
- 1.2 Different types of ponds used in fishery: Nursery pond, Rearing pond, Stock pond
- 1.3 Habit, habitat and culture methods of following freshwater forms:
 - a) Rohu (*Labeo rohita*) b) Catla (*Catla catla*) c) Mrigal (*Cirrhinus mrigala*) d) Giant prawn (*Macrobrachium rosenbergi*)

- 1.4 Harvesting methods of following marine forms:
 - a) Harpadon b) Mackerel c) Lobster d) Pearl oyster
- 1.5 Crafts and gears in Indian Fishery:
 - a) Crafts – Catamaran, Machwa, Dinghy, Dugout canoe, Built –up boat
 Gears – Gill net, Dol net, Purse net, Rampani net, Cast net
- 1.6 Fishery byproducts:
 - a) Fish meal b) Fish flour c) Liver oil d) Ising glass e) Fish glue f) Fish manure
 - g) Fish fin soup
- 1.7 Fish preservation technique :2
 - a) Chilling b) Freezing c) Salting d) Drying e) Canning

2. Agricultural Pests and their control:

- 2.1 An introduction to Pest, types of pests (agricultural, household, stored grain, structural, veterinary, forestry and nursery)
- 2.2 Major insect pests of agricultural importance (Marks of identification, life cycle, nature of damage and control measures)
 - a) Jowar stem borer
 - b) Red cotton bug
 - c) Brinjal fruit borer d) Mango stem borer e) Pulse beetle
 - f) Rice weevil
- 2.3 Non insect pest: Rats and Bandicoots, Crabs, Snails, Slugs, Birds and Squirrels
- 2.4 Pest control practices in brief: Cultural control, Physical control, Mechanical control, Chemical control, Biological control, Pheromonal control and Concept of IPM in brief
- 2.5 Plant protection appliances: Rotary duster, Knapsack sprayer, Cynogas Pump.
- 2.6 Hazards of pesticides on human and antidotes.

3. Apiculture:

- 1.1 An introduction to Apiculture, Study of habit, habitat and nesting behavior of *Apis dorsata*, *Apis indica*, *Apis florae* and *Apis mellifera*.
- 1.2 Life cycle, Colony organization and division of labour, Polymorphism
- 1.3 Bee behaviour and bee communication.
- 1.4 Bee keeping equipments:
 - a) Bee box (Langstroth type) b) Honey extractor c) Smoker d) Bee-veil e) Gloves f) Hive tool
 - g) Bee Brush h) Queen excluder
- 1.5 Bee keeping and seasonal management.
- 1.6 Bee products (collection methods, composition and uses:
 - a) Honey b) Wax c) Bee Venom d) Propolis e) Royal jelly f) Pollen grains
- 1.7 Diseases and enemies of Bees:
 - a) Bee diseases – Protozoan, Bacterial, Viral, Fungal – with two examples. b) Bee pests – Wax moth (Greater and Lesser), Wax beetle. c) Bee Enemies – Bee eater, King crow, Wasp, Lizard, Bear, Man.
- 1.8 Bee pollination

4. Sericulture:

- 2.1 An introduction to sericulture, Study of different types of silk moths, their distribution and varieties of silk produced by Mulberry, Tassar, Eri and Muga silk worms in India.
- 2.2 External morphology and life cycle of Bombyx mori.
- 2.3 Cultivation of mulberry (moriculture):
 - a) Varieties for cultivation,
 - b) Rainfed and irrigated mulberry cultivation – Fertilize schedule, Pruning methods and leaf yield.
- 2.4 Harvesting of mulberry: a) Leaf plucking b) Branch cutting c) Whole shoot cutting.
- 2.5 Silk worm rearing:
 - a) Types of rearing b) Rearing house c) Rearing techniques d) Important diseases and pests.
- 2.6 Post harvest processing of cocoons:
 - a) Harvesting and Preparation of cocoons for marketing b) Stiffling, Sorting, Storage, Deflossing and Riddling
 - c) Cocoon cooking, Reeling Equipment and Rereeling, Washing and Polishing.