

Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjunwala College of Arts, Science and Commerce

(Autonomous College)

Affiliated to University of Mumbai



Syllabus for S.Y.B.Sc.

Semester III & IV

Program: B.Sc.

Course: Zoology

(CBS 2019-20)

S.Y.B.Sc. Zoology Syllabus**DISTRIBUTION OF TOPICS AND CREDITS****Semester III**

Course code	Paper and Title	Unit	Topic	Credit
RJSUZOO301	Paper I Type study, Life processes and Developmental biology	I	Type study Earthworm	02
		II	Life processes-I	
		III	Developmental Biology	
RJSUZOO302	Paper II Biochemistry, Genetics and Molecular Biology	I	Biochemistry- I	02
		II	Genetics	
		III	Molecular Biology	
RJSUZOO303	Paper III Ecology, Fishery Biology and Economic Entomology	I	Ecosystem ecology and community dynamics	02
		II	Fishery Biology	
		III	Economic Entomology	
RJSUZOOP301, 302,303			Practicals based on Paper I, II & III	03

Semester IV

Course code	Paper and Title	Unit	Topic	Credit
RJSUZOO401	Paper I Type study, Life Processes and Cell biology	I	Type study-Cockroach	02
		II	Life processes-II	
		III	Cell biology	
RJSUZOO402	Paper II Biochemistry, Chromosomal inheritance and Evolution	I	Biochemistry-II	02
		II	Chromosomes and heredity	
		III	Evolution	
RJSUZOO403	Paper III Parasitology, Animal husbandry and Behavioural Ethology	I	Parasitology	02
		II	Animal husbandry	
		III	Behavioural Ethology	
RJSUZOOP401, 402,403			Practicals based on Paper I, II & III	03

S.Y.B.Sc ZOOLOGY

Semester III

PAPER I— TYPE STUDY, LIFE PROCESSES AND DEVELOPMENTAL BIOLOGY

Course code:RJSUZOO301

Credits: 02

Course objective :

1. To acquaint learners with the detail of earthworm as a representative of invertebrate.
2. To introduce the physiology of various life processes with evolutionary significance.
3. To introduce the learners to the basics of developmental biology

Expected outcome:

1. Learners will get an idea of general characteristic and details of invertebrate animal.
2. Learners will be able to understand increase in complexity of physiology in evolutionary hierarchy.
3. Learners will be able to understand the processes involved in embryonic development.

UNIT I: Type study; Earthworm

(15 Lectures)

1.1 Classification and Salient features.

1.2 Digestive system

1.3 Circulatory system

1.4 Excretory system

1.5 Nervous system

1.6 Reproductive system, copulation, cocoon formation and development.

1.7 Locomotion

1.8 Economic importance

UNIT II: Life processes-I

(15 Lectures)

2.1 Study of Nutrition and Excretion

2.1.1 Comparative study of Nutritional Apparatus (structure and function): *Amoeba*, *Hydra*, *Amphioxus*, Pigeon, Ruminants.

2.1.2 Physiology of digestion in human

2.1.3 Comparative study of Excretory and Osmoregulatory structures and function

a. *Amoeba* -contractile vacuoles

b. *Planaria* -Flame cells

c. Earthworm -Nephridia

2.1.4 Categorization of animals based on principle nitrogenous excretory products

2.1.5 Structure of kidney, Uriniferous tubule and physiology of urine formation in human.

2. 2 Study of Respiration

2.2.1 Comparative study of Respiratory organs (structure & function): Earthworm, Fish, Frog and Pigeon.

2.2.2 Structure of lungs and mechanism of breathing in human

2.3 Study of Reproduction

2.3.1 Asexual Reproduction- Fission, fragmentation, gemmule formation, budding.

2.3.2 Sexual reproduction;

- i. Gametogenesis
- ii. Structure of male and female gametes in human

UNIT III: Developmental Biology

(15 Lectures)

3.1. Fertilization

- i. Types of fertilization
- ii. Oviparity, viviparity, ovo-viviparity

3.2 Eggs and Cleavage

A] Types of Eggs

B] Types of Cleavage

3.3 **Types of Blastulae:** Amphibia, Bird and Mammal

3.4 **Gastrulation:** Epiboly, Emboly, invagination, involution and infiltration

3.5 Fate of three Germinal Layers and Coelom formation

PAPER II-BIOCHEMISTRY, GENETICS AND MOLECULAR BIOLOGY

Course code: RJSUZOO302

Credits: 02

Course objective :

1. To introduce various concepts of biochemistry and metabolism.
2. To introduce concepts of inheritance with special emphasis on Mendelian genetics, multiple allele, linkage and crossing over.
3. To introduce classical experiments of molecular biology, phenomenon of central dogma of protein synthesis and operon system.

Expected outcome:

1. Learners would appreciate the importance of metabolism.
2. Learners would understand and apply the principle of inheritance.
3. Learners would understand the basics and processes of molecular biology.

(15 Lectures)

UNIT I: Biochemistry I

1.1 Fundamentals of Biochemistry.

1.1.1: Buffer, pKa, Henderson-Hasselbalch equation.

1.1.2: Thermodynamics in Biochemistry, Concept of Bioenergetics.

1.1.3: Introduction to metabolism: Concept of metabolic pathways, anabolism, and catabolism.

1.2 Carbohydrate metabolism.

1.2.1 Carbohydrate metabolism-an overview.

1.2.2 Glycolysis, TCA cycle, ETS, anaerobic pathway.

1.2.3 Gluconeogenesis, HMP, Glycogenesis and Glycogenolysis.

1.2.4 Disorders: Diabetes mellitus, Glycogen storage diseases.

UNIT II: Genetics

(15 Lectures)

2.1 Introduction to genetics

2.1.1 Definition, scope and importance of genetics.

2.1.2 Classical and Modern concept of Gene (Cistron, muton, recon).

2.1.3 Brief explanation of the following terms: Allele, wild type and mutant alleles, locus, dominant and recessive traits, homozygous and heterozygous, genotype and phenotype.

2.2 Mendelian Genetics

2.2.1 Mendelian Genetics: Mendel's laws of Inheritance, Monohybrid cross, Dihybrid cross.

2.2.2 Exceptions to Mendelian Inheritance: Incomplete dominance, Co-dominance, Epistasis - Recessive, Double recessive, dominant and double dominant.

2.3 Multiple Alleles and Multiple Genes (Polygenes)

2.3.1 Concept of multiple alleles, Coat colour in rabbit, ABO and Rh blood group systems in man.

2.3.2 Polygenic inheritance with reference to skin colour.

2.4 Linkage and Crossing Over

2.4.1 Concept of Linkage and crossing over.

2.4.2 Mechanism and types of crossing over.

UNIT III: Molecular Biology

(15 Lectures)

3.1 Genetic material.

3.1.1 Experiments for proving DNA as genetic material in living organisms: Griffith's transformation experiment, Avery-Macleod and McCarty experiment, Hershey-Chase experiment.

3.1.2 RNA as genetic material: Singer & Conrat experiment.

3.1.3 Prokaryotes: Chromosomal DNA (Nucleoid) and plasmid (extrachromosomal DNA)

3.1.4 Eukaryotes: Extra-nuclear DNA in Mitochondria & Chloroplast.

3.2 Genetic code: History, concept & properties.

3.3 Flow of genetic information in prokaryotes: DNA replication, Transcription, Translation.

3.4 Operon: Concept of Operon, Structure & regulation of lac operon.

PAPER III- ECOLOGY, FISHERY BIOLOGY AND ECONOMIC ENTOMOLOGY

Course code:RJSUZOO303

Credits:02

- Course objective :**
1. To introduce the concept of ecology, ecosystem and community dynamics.
 2. To introduce learners to fishery biology with emphasis on classification, fishery community importance, method of preservation and nutritional value.
 3. To understand different aspect of economic entomology.

- Expected outcome:**
1. Learners will get an idea about types of ecosystem and succession.
 2. Learners will be able to understand importance of fishery biology.
 3. Learners will be able to understand the processes involved apiculture, sericulture and control measures for crop pest.

UNIT I: Ecosystem ecology and community dynamics. (15 Lectures)

1.1 Types of ecosystems;

1.1.1 Terrestrial ecosystem- Forest, grassland, desert and tundra

1.1.2 Aquatic ecosystem- Freshwater, estuarine and marine

1.2 Amazing ecosystems- Coral reef, Amazon Rainforest and Sunderbans

1.3 Ecological succession

1.3.1 Concept of succession.

1.3.2 Types of succession: Hydrosere and Xerosere.

1.3.3 Climax concept in succession.

UNIT II: Fishery biology (15 Lectures)

2.1- Geographical and morphological features of coastline & fishing communities in India.

2.2- Brief classification of fisheries;

a) Marine: coastal, offshore & deep sea fisheries

b) Brackish water fisheries

c) Fresh water fisheries

2.3- Important fisheries of India

2.3.1- Fin fish- Oil sardine, Mackerel, Bombay duck, Pomfret.

2.3.2- Crustacean fisheries- Prawns & lobsters.

2.3.3- Molluscan fisheries- Clams, edible oysters, loligo.

2.4- Methods of fish preservation.

2.5- Nutritive value of fish & fish products

UNIT III: Economic Entomology (15 Lectures)

3.1 Honey bee: Social life and communication, life history, Apiculture, Economic importance

3.2 Lac insect: Life history, lac culture, composition of lac & its uses.

3.3 Silk moth: Life history, Sericulture, Economic importance, types of silk.

3.4 Life history and control measures of Locust (*Schistocerca gregaria*), Aphids, Rice Weevil (*Sitophilus oryzae*).

3.5 Methods of insect control: Chemical control by synthetic and natural chemicals.

3.6 Biological control- *Bacillus thuringiensis*.

S.Y.B.Sc SYLLABUS FOR PRACTICAL SEMESTER III

Credits: 03

COURSE CODE:RJSUZOOP301 PRACTICAL I (Based on Paper I)

- Course objective :**
1. To familiarize the learner to understand various systems of invertebrate
 2. To make the learner understand different organs involved in different physiological mechanism
- Expected outcome:**
1. The learner will be able to apply the knowledge of different biochemical tests to detect excretory product.
 2. The learner will be able to make histological analysis by studying the specimen and slides

1. Study of earthworm
 - a. External characters
 - b. Digestive system
 - c. Nervous system (Demonstration)
 - d. Reproductive system (Demonstration)
 - e. Mounting- Septal nephridia, spermatheca, setae.
2. Urine analysis—Normal and abnormal constituents.
3. Detection of ammonia in water excreted by fish.
4. Detection of uric acid from excreta of birds.
5. Study of nutritional Apparatus (*Amoeba, Hydra, Amphioxus, Pigeon, Ruminant stomach*)
6. Study of respiratory structures:
Gills of bony fish and cartilaginous fish, Lungs of frog, Lungs of mammal, Air sacs of Pigeon.
7. Study of permanent slides w.r.t Reproduction: *Paramecium*- Binary fission and conjugation, Sponge gemmules, *Hydra* budding, T.S. of mammalian testis, T.S. of mammalian ovary.
8. Study of egg types –Fish eggs, Frog eggs, Hen's egg.
9. Study of Cleavage, blastula and gastrula (*Amphioxus, Frog and Bird*).

COURSE CODE:RJSUZOOP302 PRACTICAL II (Based on Paper II)

Course objective : *To make the learner understand preparation of buffer solutions and other chemicals.*

To understand the application of genetics by observation of morphological characteristic of drosophila

Introduction to study of some laboratory techniques.

Expected outcome: *Learners will get an idea about type of solution and also get hands on training on colorimeter.*

Learners will be able to understand mathematical approach and probability to solve problems based on genetics.

1. Preparation of buffer of different pH using Henderson-Hasselbalch equation
2. Preparation of titration curve for strong acid and strong base with the help of pH meter
3. Determination of pKa for weak acid
4. Colorimetry:
 - a) Selection of ideal filters
 - b) Determination of unknown concentration.
5. Study of drosophila: Phenotypic traits (eye colour, wing length, sexual dimorphism, gynandromorphs)
6. Problems in Genetics-monohybrid cross, dihybrid cross, multiple allelism.
7. Blood grouping
8. Problems based on molecular biology.

COURSE CODE:RJSUZOOP303 PRACTICAL III (Based on Paper III)

- Course objective :**
1. *To introduce the concept of biomes by introducing different animal by observing specimen.*
 2. *To introduce commercially important fishery by observing different specimens of fish*
 3. *To familiarize the learner to economically important insects with practical involving observation of specimens in the laboratory as well as on field study.*
- Expected outcome:**
1. *Learners will be able to apply knowledge of biomes on field.*
 2. *Learners will be able to identify different types of fishes and economically important insects on field.*

1. Study of different ecosystems (biomes) and their representative animals.
2. Study of commercially important fishery
 - a. Fin fish fishery- Catla, Rohu, Mackerel, Pomfret, Bombay duck
 - b. Non-fin fish fishery- Prawn, Crab, Lobster, Edible oyster)
3. Study of crafts and gears.
4. Study of honey bee:
 - a) Life cycle of honey bee
 - b) Study of bee hive.
 - c) Mouth parts,
 - d) Legs of honeybee
 - e) Sting apparatus,
5. Life cycle of Silk Moth
6. Detection of adulterants in honey
7. Study of Insects
 - a. Harmful insects :Locust, Aphids, Rice weevil
 - b. Entomophagus insect – Dragonfly
 - c. Parasite Insect – Ichneumon wasp.
8. Visit to fish market/docks/fish landing centers and submission of report.

S.Y.B.SC ZOOLOGY

SEMESTER IV

PAPER I– TYPES STUDY, LIFE PROCESSES AND CELL BIOLOGY

Course code: RJSUZOO401

Credits: 02

Course objective :

1. *To acquaint the learners with the detail study of cockroach as a representative of invertebrate.*
2. *To introduce the physiology of various life processes with evolutionary significance.*
3. *To understand the learner structural and functional organization of cell.*

Expected outcome:

1. *Learners will get an idea of general characteristic and details of invertebrate animal.*
2. *Learners will be able to understand increase in complexity of physiology in evolutionary hierarchy.*
3. *Learners will acquire insight of the structural and functional aspects of cell biology.*

UNIT I: TYPE STUDY: COCKROACH

(15 Lectures)

- 1.1 Classification
- 1.2 External characters
- 1.3 Digestive system
- 1.4 Blood vascular system
- 1.5 Respiratory system
- 1.6 Nervous system
- 1.7 Excretory system
- 1.8 Reproductive system, copulation and fertilisation.

UNIT II: LIFE PROCESSES II

(15 Lectures)

2.1 Circulation:

- 2.1.1 Comparative study of circulation: Open and closed - single and double.
- 2.1.2 Types of circulating fluids- Water, coelomic fluid, haemolymph, lymph and blood.
- 2.1.3 Comparative study of vertebrate Hearts (Structure and function)
- 2.1.4 Structure and mechanism of working of heart in human

2.2 Locomotory organs -structures and functions.

- a. Pseudopodia in *Amoeba* (sol gel theory)
- b. Cilia in *Paramecium*, Ultrastructure of cilia & ciliary movement
- c. Structure of Striated muscle fibre in human and Sliding filament theory

2.3 Control and coordination

- 2.3.1 Irritability –*Paramecium*, Nerve net in *Hydra*.
- 2.3.2 Types of neurons on the basis of structure and function
- 2.3.3 Conduction of nerve impulse: Resting potential, action potential and refractory period
- 2.3.4 Synaptic transmission

UNIT III: CELL BIOLOGY

(15 Lectures)

3.1 Structure and function of Plasma membrane, Importance of membrane fluidity and asymmetry, Membrane Transport, Passive diffusion, facilitated transport, active transport, Exocytosis and endocytosis.

3.2 Cytoplasmic Membrane System: Structure and function

- a) Cytoskeleton: Microtubules and Microfilaments.
- b) Endoplasmic Reticulum: SER, RER
- c) Golgi Complex
- d) Lysosomes: Primary and Secondary Lysosomes

3.3 Mitochondria: Structure and function

3.4 Structure of nucleus, Nuclear Pore and pore Complex, Nucleolus, Organization of Chromatin and Chromosomes.

PAPER II- BIOCHEMISTRY, CHROMOSOMAL INHERITANCE AND CELL BIOLOGY

Course code:RJSUZOO402

Credits: 02

- Course objective :**
1. To introduce various concepts of Biochemistry and metabolism.
 2. To introduce concepts of chromosome sex determination and chromosomal basis of inheritance.
 3. To familiarize learner with concept of geological timescale, adaptation, origin of life with reference to evolution.
- Expected outcome:**
1. Learners would appreciate the importance of metabolism.
 2. Learners would be able to correlate chromosome with principle of inheritance.
 3. Learners would understand different aspects of evolution.

Unit- I: Biochemistry II

(15 Lectures)

1.1 Lipid Metabolism:

1.1.1 Overview, Triacylglycerol, β - Oxidation, Ketogenesis

1.1.2 Disorders: Obesity, Diabetic ketoacidosis, Respiratory Distress syndrome

1.2 Protein Metabolism: Overview,

1.2.1 Metabolism of amino acids- transamination, deamination (oxidative and non-oxidative), Urea cycle.

1.2.2 Disorders of Urea cycle.

1.3 Intermediary metabolism: Acetyl – CoA as a common product in metabolism of carbohydrates, proteins and lipids.

UNIT II: Chromosomes and Heredity

(15 Lectures)

2.1 Chromosomes

2.1.1 Types of chromosomes—Autosomes and Sex chromosomes

2.1.2 Chromosome structure - Heterochromatin, Euchromatin

2.1.3 Classification based on the position of centromere

2.1.4 Endomitosis, Giant chromosomes- Polytene and Lamp brush chromosomes and significance of Balbiani rings.

2.2 Sex- determination

2.2.1 Chromosomal Mechanisms: XX-XO, XX-XY, ZZ-ZW.

2.2.2 Hormonal influence on sex determination-Freemartin and sex reversal.

2.2.3 Role of environmental factors- Bonellia and Crocodile

2.2.4 Barr bodies and Lyon hypothesis

2.3 Sex linked inheritance.

2.3.1 X-Linked: Colourblindness, Haemophilia

2.3.2 Y-linked: Hypertrichosis

2.4 Pedigree analysis

Autosomal; dominant and recessive, X-linked; dominant and recessive.

UNIT III: EVOLUTION

(15 Lectures)

3.1: Geological timescale.

3.2 Theories of Evolution

3.3 Origin of life: Emergence of life on primitive earth

3.4: Evolution and adaptations: Microevolution, Role of natural selection in microevolution, Co-evolution.

3.5: Ecological niches and adaptations.

PAPER III- PARASITOLOGY, ANIMAL HUSBANDRY AND BEHAVIOURAL ETHOLOGY

Course Code: RJSUZOO403

Credits: 02

Course objective :

1. To introduce key concept of parasitology.
2. To introduce the learner to the concepts of animal farming.
3. To familiarize learner with concept of animal behaviour.

Expected outcome:

1. Learners would appreciate the importance of parasite, their relation with host and life cycle.
2. Learners would be able to understand concept of types and methodology of animal farming with economic value.
3. Learners would understand different aspects of animal behaviour with special emphasis on imprinting, communication and displacement behaviour.

UNIT I: PARASITOLOGY

(15 Lectures)

1.1 Definitions: parasite, parasitism, host, vector-biological and mechanical.

1.2 Types of parasites- ectoparasites, endoparasite and their subtypes

1.3 Parasitic adaptations in ectoparasites and endoparasites

1.4 Types of hosts: intermediate, definitive and reservoir

1.5 Host-parasite relationship

Host specificity: Definition, structural specificity, physiological specificity and ecological specificity.

1.6 Protozoan and helminth parasites of man and domesticated animals:

Life cycle, pathogenicity, control measures and treatment of;

- a) *Entamoeba histolytica*,
- b) *Leishmania donovani*,
- c) *Toxoplasma gondii*,
- d) *Fasciola hepatica*,
- e) *Taenia solium*

UNIT II: ANIMAL HUSBANDRY

(15 Lectures)

2.1 Introduction: concept of integrated farming.

2.2 Poultry:

2.2.1 Definition and nomenclature.

2.2.2 Breeds of fowl (Aseel, Kadaknath, Leghorn, Rhode Island red),

2.2.3 Factors affecting size of eggs, abnormal eggs, hatching of eggs,

2.2.4 Housing and equipments, Brooding and rearing.

2.2.5 Poultry diseases- Coccidiosis, Avian flu.

2.3 Cattle Farming:

2.3.1 Classification of breeds (Milch breeds, Dual Purpose Breeds, Draught breeds, New breeds).

2.3.2 Various breeds of Cows: Indigenous – Red Sindhi, Sahiwal, Khillari, Haryana. Exotic – Holstein–Friesian, Brown Swiss, Jersey.

2.3.3 Various breeds of Buffalo: Murrah, Nagpuri, Jaffrabadi.

2.3.4 Dairy Science: Composition of Milk, Methods of Preservation of Milk Products.

UNIT III: BEHAVIORAL ETHOLOGY

(15 Lectures)

- 3.1 Concept of instincts: Innate release mechanism, significance of instincts.
- 3.2 Concepts of imprinting: Filial imprinting, sexual imprinting, Functional aspects of imprinting.
- 3.3 Displacement behaviour: Causes and functional aspects, ritualization of displacement activity.
- 3.4 Animal communication: Visual, Sound, Chemical (pheromones), Round & Waggle dance in bees.

S.Y.B.Sc SYLLABUS FOR PRACTICAL SEMESTER IV

Credits: 03

COURSE CODE:RJSUZOOP401 PRACTICAL I (Based on Paper I)

- Course objectives :**
1. To familiarize the learner to understand various systems of invertebrate
 2. To make the learner understand different organs involved in different physiological mechanism.
 3. To make the learner observe different cell organelles using permanent slide or microphotograph.

- Expected outcomes:**
1. The learner will be able to explore different systems of invertebrate.
 2. The learner will be able to make histological analysis by studying the specimen and slides.
 3. Learner can able to observe and study permeability of membrane and polytene chromosome by mounting on slide.

1. Study of Cockroach
 - a) External characters
 - b) Digestive system
 - c) Nervous system (Demonstration)
 - d) Reproductive system (Demonstration)
 - e) Mounting- ommatidia, mouth parts, trachea & spiracles,
2. Study of hearts (Cockroach, Shark, Frog, Calotes, Crocodile and Mammal)
3. Study of locomotory organs (Amoeba, Cockroach, Unio, Starfish, Fish, and Birds)
4. Study of striated and non- striated muscle fibre
5. Ultra structure of cell organelles – (Electron micrographs)
 - a.Nucleus
 - b.Endoplasmic reticulum (smooth and rough)
 - c.Mitochondria.
 - d.Golgi apparatus
 - e.Lysosomes
6. Study of permeability of cell through plasma membrane (Osmosis in blood cells).
7. Mounting of Polytene chromosome.

COURSE CODE:RJSUZOOP402 PRACTICAL II (Based on Paper II)

Course objectives :

1. *Introduction of study of laboratory technique and diagnostic test.*
2. *To familiarize learner to the concept of evolution with practical involving observation of specimens in the laboratory.*

Expected outcomes:

1. *The learner will be able to use instrument and kits for clinical diagnostics in pathology laboratory*
2. *The learner will be able to study cell division for different research purpose.*

1. Estimation of creatinine from serum/urine sample.
2. Estimation on serum cholesterol.
3. Study of mitosis (onion root tip)
4. Mounting of Barr body
5. Problems based on genetics-X-linked inheritance.
6. Pedigree analysis(X-linked- dominant, recessive), Autosomal (dominant, recessive).
7. Study of fossils-Trilobite, Ammonite, Archaeopteryx.
8. Study of evidences of evolution:
 - a. Analogy – Leg of grasshopper and leg of mammal, Wing of insect and wing of bird.
 - b. Homology - Fore limb of amphibian and fore limb of reptile, Wing of bird and forelimb of man.

COURSE CODE: RJSUZOO403 PRACTICAL III (Based on Paper III)

Course objective : 1. *Introduction of study of laboratory techniques and diagnostic tests useful for animal farming.*

2. *To familiarize learner to parasitology with practical involving observation of specimens in the laboratory.*

Expected outcome: 1. *The learner will be able to use instruments and technique for diagnosis of milk product and adulterants.*

2. *The learner will be able to identify and select different breeds for animal farming.*

1. Study of endoparasites
 - a. Protozoan parasites- *Trypanosoma gambiense, Entamoeba histolytica*
 - b. Helminth parasites- *Ancylostoma duodenale, Taenia solium*
2. Study of Ectoparasites: Leech, Tick, Mite
3. Poultry – Aseel, Kadaknath, Leghorn, Rhode island red
4. Cattle breeds-
 - a. Cow breeds-Indigenous: Red Sindhi and Sahiwal.
Exotic: Jersey, Holstein Friesian,
 - b. Buffalo breeds- Murrah, Nagpuri and Jaffrabadi
5. Quantitative estimation of proteins from eggs.
6. Extraction and qualitative test of casein from milk.
7. Measurement of density of milk samples by Lactometer.
8. Detection of milk adulterants: starch, urea, glucose.
9. To evaluate the quality of milk by methylene blue reduction method.
10. Study of ethological aspects:
 - a) Instincts
 - b) Imprinting
 - c) Communication in animals: Chemical signals and sound signals
 - d) Displacement activities in animals: Courtship and mating behavior in animals and ritualization.
12. Field visit to a natural ecosystem/dairy industry/apiary/sericulture unit and report submission

SCHEME OF EXAMINATION (FOR BOTH SEMESTERS)

Internal examination

The first internal class test comprising of 20 marks shall consist of 20 multiple choice questions with equal weightage.

The second class test comprising of 20 marks shall consist of 20 multiple choice questions with equal weightage.

External theory paper pattern

Total: 60 marks

Q.1 Based on Unit I..... 15M

- a. 8 M
- b. 7 M

OR

- a. 5 M
- b. 5M
- c. 5M

Q.2 Based on Unit II.....15M

- a. 8 M
- b. 7 M

OR

- a. 5 M
- b. 5M
- c. 5M

Q.3 Based on Unit III.....15M

- a. 8 M
- b. 7 M

OR

- a. 5 M
- b. 5M
- c. 5M

Q.4 Short notes (mixed on all units).....15M (5marks each)

- a or a (Unit I)
- b or b (Unit II)
- c or c (Unit III)

**QUESTION PAPER FOR PRACTICAL EXAMINATION
SEMESTER III**

PRACTICAL I

	Total marks: 50
Q.1 Major experiment	12M
Urine analysis/ Dissection of earthworm digestive system	
Q.2 Minor experiment	08M
Detection of ammonia/uric acid	
Q.3 Mounting of septal nephridium/setae/spermatheca (any one)	05M
Q.4 Identify and describe	15M
a. One specimen from nutritional apparatus	
b. One specimen from respiratory structures	
c. One specimen from reproductive structures	
d& e. specimens from types of eggs, cleavage, blastula & gastrula	
Q.5 Viva	05M
Q.6 Journal	05M

PRACTICAL II

	Total marks: 50
Q.1 Major experiment	12M
(Titration curve/pKa/Determination of unknown concentration)	
Q.2 Minor experiment	08M
(Preparation of buffer/Blood grouping/ Selection of ideal filter)	
Q.3 Identification (any one Phenotypic trait of Drosophila)	05M
Q.4 a. Problems based on genetics (two problems)	08M
b. Problem based on molecular biology	07M
Q.5 Viva	05M
Q.6 Journal	05M

PRACTICAL III

	Total marks: 50
Q.1 Major experiment	12M
Detection of honey adulterants	
Q.2 Mountings of honey bee (Legs/mouth parts/Sting apparatus)	05M
Q.3 Identification	18M
a. One animal from ecosystem (biome) study	
b. One specimen from fin fish fishery	
c. One specimen from non-fin fish fishery	
d. One specimen from craft/gear	
e. Life cycle of silk moth/honey bee/ structure of beehive	
f. One specimen from economic entomology	
Q.4 Report on fish market visit.	05M
Q.5 Viva	05M
Q.6 Journal	05M

**QUESTION PAPER FOR PRACTICAL EXAMINATION
SEMESTER IV
PRACTICAL I**

	Total marks: 50
Q.1 Major experiment (Osmosis/Polytene chromosome/Digestive system of cockroach)	12M
Q.2 Minor experiment (Mountings of cockroach- Spiracles/ cornea/ mouth parts)	08M
Q.3 Identification a. One specimen from study of hearts b & c. Specimens from locomotary organs and muscles d & e. Electron micrographs of cell organelles	15M
Q.4 Viva	05M
Q.5 Journal	05M

PRACTICAL II

	Total marks: 50
Q.1 Major experiment Estimation of creatinine/cholesterol	12M
Q.2 a. Problem based on genetics.	06M
b. Problem based on pedigree analysis	05M
Q.3 Minor experiment Mitosis/ Barr body mounting	08M
Q.4 Identification based on evidences of evolution a, b and c (fossils, homology & analogy)	09M
Q.5 Viva	05M
Q.6 Journal	05M

PRACTICAL III

	Total marks: 50
Q.1 Major experiment Estimation of protein/milk adulterants	12M
Q.2 Minor experiment Extraction of casein/MBRT/Lactometer	08M
Q.3 Identification a. One example from Protozoan/Helminth parasite b. One example from ectoparasites c. One example of poultry breed d. One example of cattle/buffalo breed e & f. examples from ethology	12M
Q.4 Report on field visit.	08M
Q.5 Viva	05M
Q.6 Journal	05M

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