



**SOMAIYA**  
**VIDYAVIHAR**

K J Somaiya College of Science & Commerce

**Department: Zoology**



**T R U S T**

**S. Y. B.Sc. Syllabus**

**K J Somaiya College of Science & Commerce**  
Autonomous (Affiliated to Mumbai University)  
Vidyavihar  
Mumbai-400077

**Department of Zoology**

Syllabus

for

**S.Y.B.Sc.**

(to be implemented from 2019 - 2020)



## **Preamble**

The syllabus of S.Y.B.Sc. Zoology was revised this year [BOS held on 14.01.2019] and will be effective from the academic year 2019-20. It has been modified keeping in mind the capabilities of the present learner and the need of the hour.

The syllabus includes advanced concepts of zoology, which have been built up from first year and will percolate into third year, to give the student a well-rounded grasp over the subject. Topics related to concepts such as Adaptation in Non-Chordates, Chordates, Cell biology, physiology, parasitology and nutrition are covered along with applied topics like Introduction to Wildlife conservation and Genetics. Reflecting the changing demands of the job market, subjects such as Field biology, Zoo keeping etc. have also been included. The practical aspect of each core subject is designed to equip the student with skills required for handling different instruments, learn techniques such as karyotyping and identification of different animal groups.

Thus the syllabus revision aims at bridging the gap between First year and Third year Zoology, thereby empowering the learner to not only gain in depth knowledge of Zoology but simultaneously develop skills required to secure a good career in Zoology.

**Dr. V.V Deshmukh**

**HOD**

**ZOOLOGY**

**January 2019**

**Syllabus for S.Y.B.Sc.**

**Course: Zoology**

**Implemented from Academic Year 2019-2020**

**SEMESTER III**

Course Code	Module	Topics	Credits	Lectures /week
<b>19USZ031</b>	I	Adaptation in Non-Chordates	2	3
	II	Adaptation in Urochordates & Chordates		
	III	Comparative vertebrate embryology		
<b>19USZ032</b>	I	Cell organelles	2	3
	II	Cell cycle and cell division		
	III	Fundamentals of Genetics		
<b>19USZ033</b>	I	Economic entomology	2	3
	II	Animal farming		
	III	Aquaculture and Fishery		
		Practical based on all three courses	3	
		TOTAL	9	9

**SEMESTER IV**

Course Code	Module	Topics	Credits	Lectures/week
<b>19USZ041</b>	I	Ecosystems and Population dynamics	2	3
	II	Animal behaviour		
	III	Study of tissue		
<b>19USZ042</b>	I	Homeostasis	2	3
	II	Nutrition and Health		

	III	Human Genetic disorders		
<b>19USZ043</b>	I	Introduction to Parasitology, Study of Protozoan parasites	2	3
	II	Study of Helminth & Arthropod parasites		
	III	Wild life Conservation and Zoo keeping		
		Practical based on all three courses	3	
		TOTAL	9	9

### Modes of Content Delivery:

We will be using the following modes of content delivery:

- The classroom teaching will be mostly based on **Chalk and talk** lectures, few **seminars and discussions**.
- The **study material** will be provided in advance in the form of texts and pdfs [**flipped classroom**]. Periodic quizzes and group discussions will be conducted to keep the interest of the student.
- Laboratory is an integral part of learning in Zoology, hence the teaching will continue in the lab using **animal specimen** and **powerpoint presentations**.
- **Good lab practices** and **Standard operating procedures** will be inculcated in the students.
- **Field trips** and long excursions are conducted [short and long] to get the student closer to nature and wildlife and experience what they learn.
- **Small lab projects** are encouraged to hone the research aptitude of the learner.
- **Guest lectures** are organised by subject / field experts to get a better perspective on the subject
- **Career Guidance** is given by inviting successful Alumni and others from Zoology to motivate the student.



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**SYLLABUS**

**S.Y.B.Sc.**

**Theory**

**Semester III**

**Course 1 (19USZ031)**

**Adaptation in Non chordates, Chordates and Comparative Vertebrate Embryology**

**Course Outcome:**

1. To understand the diversity in Non chordates by learning various adaptations in each of Non Chordate Phyla with the help of examples.
2. To understand the diversity in Chordates by learning various adaptations in Chordates with the help of examples.
3. To identify the different stages of vertebrate embryo and apply that knowledge to deduce the age of embryo.

**Module I**

**12L**

**Adaptation in Non-Chordates**

1. Protozoa: Skeleton and Reproduction.
2. Porifera: Canal Systems, Spicules and Reproduction.
3. Coelenterata: Polymorphism, Types and theories of formation of coral reefs.
4. Helminthes: Parasitic adaptations in Helminthes.
5. Annelida: Reproduction.
6. Arthropoda: Crustacean Larvae and Metamorphosis in insects.
7. Mollusca: Shell and Foot, Torsion
8. Echinodermata: Water Vascular System and Larvae

## **Module II:**

### **Adaptation in Urochordate and Chordates**

**12L**

1. Retrogressive metamorphosis in Ascidians.
2. Swim bladder, Breeding and Parental Care in Fishes.
3. Neoteny and Parental Care in Amphibians.
4. Adaptive Radiations in Reptiles
5. Venomous and Non- Venomous snakes.
6. Migration in Birds.
7. Egg laying Mammals and Marsupials.
8. Aquatic Mammals.

## **Module III**

### **Comparative vertebrate Embryology**

**12L**

1. Fertilization – types, process, importance
2. Parthenogenesis – definition, types, importance
3. Eggs – structure and types
4. Cleavage – structure and types
5. Types of blastulae
6. Processes during gastrulation in brief
7. Fate of germinal layers and theories of coelom formation



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**Course 2 (19USZ032)**

**Cell biology and Genetics**

**Course Outcome:**

1. To understand ultrastructure and functions of different cell organelles and related disorders.
2. To understand cellular architecture and identify various stages of cell division and growth.
3. To understand basic concepts of Neo Mendelian Genetics in order to apply this knowledge to research.

**Module I:**

**Cell organelles**

**12 L**

1. Basic study of cell biology using microscope –historical perspective Different stains and staining techniques
2. Structure and functions of a. Plasma membrane b. Endoplasmic reticulum c. Ribosomes d. Golgi complex e. Mitochondria f. Lysosomes
3. Cell organelles and disorders.

**Module II:**

**Cell cycle and cell division**

**12L**

1. Cell cycle and its significance
2. Study of nucleus and chromosomes
3. Replication of DNA during cell cycle
4. Study of microtubules
5. Cell division: Meiosis and mitosis
6. Cell poisons



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**Module III:**

**Fundamentals of Genetics**

**12L**

1. Sex determination
  - 1.1 Methods of sex determination: Chromosomal- XX, XO, XX-XY and ZZ-ZW.
  - 1.2 Genie Balance Theory of Sex determination in Drosophila, Environmental sex determination
  - 1.3 Lyon's Hypothesis of X chromosome inactivation.
2. Inheritance related to Sex
  - 2.1 X Linked, Y linked and Z linked with suitable examples
  - 2.2 Sex limited and Sex influenced Genes
3. Multiple Alleles
  - 3.1 Concept, definition, characters and symbolism,
  - 3.2 coat colour in rabbit, eye colour and Vestigial wing alleles in Drosophila
  - 3.3 ABO blood group system and Rh factor in human.
4. Quantitative or Polygenic Inheritance
  - 4.1 Concept and definition
  - 4.2 Skin colour, Eye colour and Height in Human
  - 4.3 Milk gene in Cow, Meat gene in Poultry
5. Concept of linkage and crossing over

**Course 3 (19USZ033)**

**Economic Zoology**

**Course Outcome:**

1. Identify the opportunities of financial independence by insect culturing methods, their products and economic impact of harmful insects on agriculture etc.
2. To develop entrepreneurial skills in the learners by inculcating the knowledge of management of various farm animals and introducing the concept of integrated farming.



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3. Identify the opportunities of financial independence by fish culturing methods and their products. OR develop their expertise on the field by learning various aspects of field biology.

### **Module I:**

#### **Economic entomology**

**12L**

1. Study of Useful Insects:
  - A) Honey Bee: Social life, Communication, Apiculture and Economic importance.
  - B) Silk Moth: Life history, Sericulture, Economic importance.
2. Study of Destructive Insects: Aphids, Locust, Rice weevil, Termite.
3. Methods of insects Control: Chemical Control and Biological control.

### **Module II:**

#### **Animal farming**

**12L**

1. Definition & concept of integrated farming. Basic requirements of animal farming
2. Poultry - types of breeds, egg quality, egg hatching, equipment, brood management, products, diseases (one protozoan, one viral)
3. Goat, Sheep, Cattle farming: breeds, artificial insemination, breeding management and diseases, products of goat, sheep.
4. Dairy Science: Dairy design and management, Composition of milk, methods of preservation, milk products
5. Vermiculture



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**Module III:**

**Aquaculture and Fishery**

**12L**

1. Introduction to aquaculture and aquaculture practices in India
2. Types of aquaculture: Freshwater aquaculture, Composite fish culture, Sewage- fed fish culture, integrated fish farming etc.
3. Types of Fisheries- Basic knowledge of crafts and gears used for various types of fisheries. Fresh water, Brackish Water, Marine: Coastal, Offshore and deep Sea fisheries, Fresh water fisheries: Riverine - Major carps, Important Capture Fisheries of India
4. Fin- fish: Oil sardine, mackerel, Bombay duck, Pomfret and Shark
5. Crustacean fisheries: Prawns, crabs and lobsters
6. Molluscan fisheries: Mussels and clams, Edible and pearl oyster, process of pearl formation.

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**SYLLABUS**

**S. Y. B. Sc. Zoology**

**Practical**

**Semester III**

**Course 1 (19USZO3P1)**

1. Observation of Binary fission and Conjugation in *Paramecium* [Permanent Slides]
2. Observation of V. S. of *Grantia* and L.S. of *Leucosolenia*
3. Observation of Polymorphism: *Obelia* Colony and medusa, *Physalia*, *Vellela*, *Porpita*
4. Observation of Corals: *Fungia*, *Madrepora*, *Meandrina* [Brain Coral], *Tubipora* and Sea Fan.
5. Observation of Liver fluke, T. S. and its Larvae
6. Observation of Heteronereis and Trochophore Larva
7. Study of Crustacean Larvae: Nauplius, Zoea, Megalopa, Alima, Mysis and Phyllosoma
8. Study of Metamorphosis in insect:
  - a) Juvenile and adult of *Lepisma*
  - b) Life history of -
    - 1) House fly
    - 2) Mosquito (*Culex* or *Anopheles*)
    - 3) Beetle
    - 4) Butterfly
9. Study of shells in Mollusca: *Chiton*, *Dentalium*, *Trochus*, *Placuna*, *Solen*, *Sepia*, *Nautilus*, Sinistral and Dextral Shells
10. Study of Echinoderm larvae: Bipinnaria, Ophiopleuteus, Echinopleuteus, Auricularia, Doliolaria
11. Embryology:
  - A] Study of different types of eggs: Isolecithal, Mesolecithal, Telolecithal
  - B] Study of blastulae: Amphioxus, Frog, and Mammal
  - C] Study of gastrulae:
    - a] Frog

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b] Primitive streak of chick embryo

12. Study of Ascidian tadpole (retrogressive metamorphosis)
13. Study of swim bladder
14. Parental Care and Breeding - Sea horse, Gourami, Siamese fighter, Cat fish, Tilapia, Caecilian, Midwife toad, Neoteny (axolotl larva)
15. Adaptive radiation in reptiles: Turtle, Tortoise, Chameleon, Phrynosoma, Wall lizard, Rat, Snake, Sea Snake, Crocodile or Gharial
16. Study of venomous snakes: Identification key for Krait, Cobra, Russell's viper, Saw scaled viper, Jaw of venomous snake
17. Study of Adaptive radiations in Mammals: Duck billed Platypus, Kangaroo, Bottle nose dolphin, Blue whale, Sea Cow [Dugong]

**Course 2 (19USZ03P2)**

1. Study of Osmosis using RBCs
2. Study of ultrastructure of cell organelles using electron micrograph-Mitochondria, Endoplasmic reticulum, Golgi complex, Nucleus and Lysosomes
3. Study of chromosome morphology using onion root tip-squash preparation
4. Study of Polytene chromosome: Temporary preparation of salivary gland chromosome of Chironomous larva/ drosophila/ mosquito.
5. Mounting of Barr body
6. Observation of single nucleus, polymorphonuclear neutrophils, micro and macronucleus in Paramoecium, micro nuclei in liver cells
7. Problems in genetics

**Course 3 (19USZ03P3)**

1. Economic entomology: Honey bee- Bee hive, Honey, Bee wax, Silk Moth- Cocoon
2. Mountings of honeybee: Mouth parts, Legs of honeybee, Sting apparatus,
3. Study of Insects

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- I. Harmful insect –Locust/ Grasshopper, Aphids, Rice weevil, Termite, Lemon butterfly
  - II. Entomophagus insect – Dragonfly
  - III. Parasite Insect – Ichneumon wasp.
4. Animal husbandry
    1. Poultry – Layers (Leghorn), Broiler (Kadakhnath)
    2. Goat – Jamnapari, Surti
    3. Sheep – Gaddi, Marwari
    4. Cattle – Milch, Sahiwal
    5. Dual purpose breed – Haryana
    6. Draught purpose – Khillari
    7. Buffalo- Murrah, Jaffrabadi
  5. Preparation of feasibility report
  6. Detection of adulterants in the milk
  7. Milk density by lactometry (Demonstration)
  8. Study of Crafts & Gears:  
Crafts: 1) Dugout Canoe 2) Out-rigger 3) Satpati 4) Trawlers 5) Masula  
Gears: 1) Cast net 2) Gill net 3) Dol net 4) Outrigger (Rampani)
  9. Study of Fresh water & Marine fishes with respect to Aquaculture & Fishery  
Freshwater fishes- Rohu, Catla, Mrigal and Sea Bass  
Marine Fishes- Mackerel, Oil Sardine, Pomfret and Shark
  10. Study of Crustacean and Molluscan fishery  
Crustacean fishery- Prawn and Crab (one marine and one freshwater each)  
Molluscan fishery- Pearl Oyster, Clam (Katelaysia), *Sepia aculeata*
  11. Field visit and submission of report –poultry farm, animal husbandry farm, apiary, sericulture plant, dairy farm, sheep farm, seashore, aquaculture farm  
[visit to minimum any one of them as a part of short or long tour – as per curriculum]



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**Theory**

**Semester IV**

**Course 1 (Code: 19USZ041)**

**Ecosystems and Population dynamics, Animal behaviour, Study of tissue**

**Course Objectives:**

1. To acquire significant knowledge of different ecosystems and their population dynamics to conserve them at different levels.
2. To understand various aspects of various animals around them and to develop interest in research & employability.
3. To comprehend tissue level of organization as a foundation for organ level of organization to be covered in higher classes. Student will learn different types of tissues, their structure, functions, role in body & relevant examples.

**Module I**

**Ecosystems and Population dynamics**

**12L**

1. Ecosystem- definition, structure of ecosystem, major and minor ecosystem, natural and artificial ecosystems.
2. Abiotic factors- Atmosphere, Topography, Light, Temperature, and Precipitation. Soil – components and profile
3. Natural ecosystems- Marine, Freshwater, Terrestrial- Forest, grassland and desert biomes
4. Biotic factors- community ecology, concept of ecological niche and ecological succession

5. Population ecology- concept of dynamic nature, Factors influencing population dynamics- Natality, mortality, survivorship curves, population growth and growth curves, migration.

### **Module II:**

#### **Animal behaviour**

**12L**

1. Behavioural patterns during development
  - (1) Instinct, IRM, FAP, significance of instinct
  - (2) Imprinting- long term and functional aspect of imprinting, types of imprinting
  - (3) Decision making: Prolonged conflict and stress
2. Displacement behaviour- causes and functional aspects Ritualization of displacement activities
3. Communication: a) Components of communications b) Signals- chemical, light and sound c) Mimicry, deception and honesty.
4. Altruism

### **Module III**

#### **Study of tissue**

**12L**

1. Introduction to tissue, properties of normal and abnormal tissue
2. Types of tissue: Epithelial, Connective, Nervous and Muscular
  - 1) Epithelial –A. Simple- Squamous, Columnar, Ciliated, Glandular, Endothelial [ T.S of artery and T.S. of vein] B. Stratified [ Study of skin]
  - 2) Connective tissue- Areolar, Adipose, Blood, Bone [T.S of Bone], Cartilage [T.S of Cartilage]
  - 3) Nervous - Myelinated, Non myelinated, Glial cells
  - 4) Muscular – Striated, Non striated, Smooth/ Cardiac
3. Disorders related to Tissue



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**Course 2 (19USZ042)**

**Homeostasis, Nutrition and Health, Human Genetics disorders**

**Course Objectives:**

1. To understand various concepts of homeostasis in animal kingdom & different adaptations with respect to thermoregulation & osmoregulation.
2. To identify various factors affecting health with respect to nutrition & addiction.
3. To identify causes and symptoms of chromosomal disorders.

**Module I:**

**Homeostasis**

**12L**

1. Basic concept of Homeostasis, regulatory mechanisms and extremophiles.
2. Osmotic and ionic regulation: Basic concept of osmoregulation, Problems faced in iso-osmotic, hypo-osmotic, hyper-osmotic and terrestrial environments, adaptation to these environments. Extremophiles in relation to osmotic environment, Hormones that control osmotic and ionic regulation.
3. Temperature regulation: Poikilotherms and homeotherms, Various mechanisms of heat production and heat loss, Adaptative hypothermia, Extremophiles in relation to temperature.
4. Some diseases due to imbalance in homeostatic mechanisms

**Module II:**

**Nutrition and Health**

**12L**

1. Introduction, dietary recommendations to a normal adult, infant, pregnant woman and aged.
2. Malnutrition disorders.



3. Significance of breast feeding.
4. Importance of fibres in food.
5. Constipation, piles, anorexia, starvation, acidity flatulence, ulcers, urticaria.
6. Fasting and its significance.
7. Defects of modern food habits - mention food additives, BMI and its significance.
8. Different feeding habits -vegetarians, non-vegetarians and vegans
9. Life style diseases- diabetes type I and II, insulinoma, hyperinsulinism
10. Alcoholism, smoking and drug addiction:
  - 1) Alcoholic beverages, physiological effects of alcohol, treatment,
  - 2) Smoking: rights of non-smokers, composition and effects of tobacco smoke, the smoking habits (active and passive smoking), legislation,
  - 3) Substance abuse: Narcotics and psychotropic drugs affecting social fabric of India- e.g. opium, brown sugar, Heroin.

**Module III: Human genetic disorders**

**12L**

1. Normal human karyotype: Karyotype preparation & banding techniques, band numbering scheme, human genome project.
2. Chromosome non-disjunction:
  - 1) Process of non-disjunction & its genetic implications,
  - 2) Non-disjunction of autosomes: Trisomy 21 & Trisomy 13,
  - 3) Non-disjunction of sex chromosomes: Turner's & Klinefelter's syndromes, XYY males
3. Other chromosomal anomalies: Deletions & duplications with examples, micro-deletion & micro-duplication with examples, translocation- D-G translocation
4. Other abnormalities like Inversions, ring chromosomes, polyploidy.



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### Course 3 (19USZ043)

#### Economic Zoology

#### Course Objectives:

1. To study the cause of protozoan parasitic diseases by understanding its symptoms and to be aware of the prophylaxis and generic treatment for the same.
2. To identify the causes of the Helminth and Arthropodan parasitic diseases by studying its symptoms and to be aware of the prophylaxis and generic treatment for the same.
3. To Design and maintain zoo and explore various job opportunities in zoos. OR To understand the working of significant lab equipment and their applications.

#### Module I:

#### **Introduction to Parasitology, study of Protozoan parasites 12L**

1. Types of Parasites and Hosts: Parasites: Ectoparasite, Endoparasite, Monogenetic, Digenetic, Temporary, Permanent, Extracellular parasites, Intracellular, Facultative, Accidental. Types of Host: Definitive, Intermediate, paratenic, Reservoir. Host- parasite relationship
2. Study of Protozoan Parasites: Morphology, Mode of Infection, Life-cycle, Pathogenicity, Treatment, Control measures and Economics involved: *Entamoeba histolytica*, *Plasmodium vivax*, *Leishmania donovani* and *Giardia lamblia*.

#### Module II

#### **Study of Helminth and Arthropod Parasites 12L**

Morphology, Mode of Infection, Life-cycle, Pathogenicity, Treatment Control measures and Economics involved:



a) Helminthes: *Taenia solium*, *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Wuchereria bancrofti*.

b) Ectoparasite: Head louse, Bed bug, Tick and Mite.

**Module III:**

**Wild life Conservation and Zoo keeping**

**12L**

1. Wild Life and conservation

- 1) Forest resources, National forest policy, forestry and wildlife research, education and training in India,
- 2) India biodiversity: rare and endangered animals of India: wildlife conservation projects; important national parks, and sanctuaries (Sanjay Gandhi, Gir, Dachigam, Bharatpur, Sunderbans, and Bandipur-Mudumalai)
- 3) Wildlife management: Definition, causes of wildlife depletion, importance of wildlife, management in India with emphasis on Western Ghats, Ecotourism, Biopiracy

2. Zoo keeping

- 1) Zoo – definition, etymology, history, Different types of zoos.
- 2) Zoo design: Basic personnel requirement of zoo – managerial, commercial, scientific, staff requirement – zoo keeper, volunteer, scientist, veterinary doctors, managers, clerks, clean up team, security.
- 3) Significance of zoo – recreation, awareness, education, conservation, rehabilitation (man eater, rescued animals etc.)
- 4) Central Zoo Authority of India, World zoos, Indian zoos



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**S. Y. B. Sc. Zoology**

**Practical**

**Semester IV**

**Course 1 (19USZ04P1)**

1. Ecology:

- a] Qualitative estimation of free carbon dioxide in water
- b] Qualitative estimation of DO of water
- c] Qualitative estimation of Salinity in water
- d] Determination of total Hardness of water
- e] Determination of pH of soil and texture of soil (coarse and fine)

2. Ethology-

- a) Mimicry, Instinct, Imprinting, Displacement Activities in animals, Ritualization
- b) Communication in Animals: Chemical Signals, Light Signals,  
Language development in Bees

3. Study of slides of following human tissue-

- blood smear,
- bone,
- cartilage,
- skin,
- artery and vein

4. Mounting of Nerve fibre, muscle fibre

**Course 2 (19USZ04P1)**

1. Extraction of casein
2. Detection of glucose by GOD/POD method
3. Colorimetric estimation of protein from two different varieties of Hen's egg (Biuret or Folin Lowry method)
4. Study of Normal human karyotype
5. Study of abnormal human karyotypes



- a. Down's Syndrome
  - b. Klinefelter's Syndrome
  - c. Turner's Syndrome
  - d. Edward's Syndrome
  - e. Patau's Syndrome
6. Interpretation of ECG
  7. Spotting related to fitness and addiction
  8. Project on health awareness- Survey

### **Course 3 (19USZ04P3)**

1. Study of Protozoan parasites:  
Identification of Entamoeba histolytica, Plasmodium vivax, Leishmania, Giardia
2. Study of Helminth Parasites:  
Identification of Taenia, Ancylostoma, Ascaris, Wuchereria and Dracunculus
3. Parasitic adaptation – Scolex & Mature Proglottid of Tapeworm
4. Study of ectoparasites- Head louse, Bed bug, Tick, Mite
5. Estimation of Cholesterol by FeCl<sub>3</sub> Method
6. Estimation of Triglyceride by phosphovanillin method
7. Wild life conservation and Zookeeping-Plotting of the location of National parks and Sanctuaries on Map of India and enlist the major fauna
8. Identify the endangered species and give the reason of decline
9. Basic designing of a zoo (based on species of animals, their numbers and sex)
10. Economics of zoo- Prepare plan as per number of visitors, daily expenses, salaries, entry fee or entire budget

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**Suggested NPTEL/SWAYAM Courses/MOOC**

2. **Animal physiology**
3. **Wildlife ecology**
4. **Forest biometry**
5. **Human Molecular Genetics**

**Scheme of examination –Theory**

Internal Assessment: written test (30/25 marks) assignment (10/15 marks)

External Assessment: Semester end written test (60 marks) per course

**Scheme of examination – Practicals**

Semester end examination – 150 Marks



**Semester End Theory Question Paper**

**(Paper I, II and III) Max. Marks: 60**

**Duration: 2 Hrs**

1.	Describe any three (ON MODULE I) i. ii. iii. iv.	05 05 05 05 05
2.	Explain any three (ON MODULE II) i. ii. iii. iv.	05 05 05 05 05
3.	Write note on any three (ON MODULE III) i. ii. iii. iv.	05 05 05 05 05
4.	Enumerate on any three (MODULE I to MODULE III; MIX WEIGHTAGE) i. ii. iii. iv.	05 05 05 05 05



**Practical Q.P. (Paper I, II and III)**

**Max. Marks: 50; Duration: 3 Hrs**

Q. No.		Max. Marks (50)
1.	Major Experiment	12 to 14
2.	Minor Experiment	08
3.	Identification	15 to 18
4.	Journal	05
5.	Viva voce	05