SOPHIA COLLEGE, (AUTONOMOUS)

Affiliated to

UNIVERSITY OF MUMBAI

Programme: Zoology

Programme Code: US.ZOO

F.Y.B.Sc. Zoology

(Choice Based Credit System with effect from the year 2018-19)

Programme Outline: FYBSc Zoology (SEMESTER I)

Course Code	Unit No	Name of the Unit	Credits
US.ZOO.1.01		SYSTEMATIC CLASSIFICATION OF INVERTEBRATES AND ECOLOGY	2
	1	Classification of Animal Kingdom	
	2	Ecosystem	
	3	Population Ecology	
US.ZOO.1.02		APPLIED BIOLOGY	2
	1	Laboratory Safety and Units of Measurement	
	2	Animal Biotechnology	
	3	Instrumentation	
US.ZOOP.1		Practical I	2
		Practical II	

Programme Outline: FYBSc Zoology (SEMESTER II)

Course Code	Unit No	Name of the Unit	Credits
US.ZOO.2.01		BIODIVERSITY, EVOLUTION AND ETHOLOGY	2
	1	National Parks and Sanctuaries	
	2	Evolution	
	3	Ethology	
US.ZOO.2.02		GENETICS AND BIOCHEMISTRY	2
	1	Genetics and Nucleic acids	
	2	Biochemistry	
	3	Nutrition and Public Health	
US.ZOOP.2		Practical I	2
		Practical II	

Preamble:

This syllabus of Zoology Program offered by Sophia College for Women, Mumbai has been designed under the autonomous status conferred in the academic year 2018-2019.

The syllabus tries to encompass fundamental as well as applied areas such as taxonomy, developmental biology, genetics, physiology, evolution, ecology, biochemistry, as well as applied biology disciplines like biotechnology, bioinformatics, forensic science, and many others. The syllabus is planned such that the learners who are beginning their academic journey opting for the subject of Zoology will be equipped with not only the basic knowledge of the animal world but also the recent trends in the subject.

Learning of the subject would involve various innovative pedagogies such as experiential learning, problem-based learning, collaborative learning in addition to the traditional mode of learning. Besides sensitizing the learners towards environment and sustainability, the subject also offers career opportunities in a variety of fields such as conservation, research, education, and animal management. Due care would be taken to adhere to the directions as given in the UGC Circular F14-4/2006 (CPP-II) while conducting practicals involving animal types.

PROGRAMME OBJECTIVES

PO 1	To provide a holistic knowledge about animal biology such as taxonomy, comparative anatomy and physiology, behaviour, ecology and evolution.
PO 2	To develop experimental and research-oriented skills for future career in academia
PO 3	To gain field-based knowledge through experiential learning
PO 4	To get acquainted with the applied areas of zoology to promote employability and entrepreneurship
PO 5	To encourage understanding about the importance of biodiversity conservation, the threats facing ecosystems and the conservation measures used to preserve wildlife

PROGRAMME SPECIFIC OUTCOMES

PSO 1	Apply the field-based and the in-class knowledge of animal biology to identify and classify the animals in their natural habitat upto class level
PSO 2	Identify the various types of animal behaviour, and animal interactions with the ecosystem
PSO 3	Conduct basic research that involves application of critical thinking and experimental skills

PSO 4	Get career opportunities in a variety of fields such as conservation, research, education, and animal management

SEMESTER I

NAME OF THE COURSE	SYSTEMATIC CLASSIFICATION OF INVERTEBRATES AND ECOLOGY	
CLASS	FYBSc ZOOLOGY	
COURSE CODE	US.ZOO.1.01	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	3	
TOTAL NUMBER OF LECTURES PER SEMESTER	45	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	25	75
PASSING MARKS	10	30

COURSE OBJECTIVES:

CO 1.	To understand the classification of invertebrates through the general characteristics of phyla up to class level and specific characters of the respective organisms.
CO 2.	To impart knowledge of different components of ecosystem
CO 3.	To make students aware about significance of coexistence of human beings with all other living organisms.
CO 4.	To understand the dynamics of population ecology

COURSE LEARNING OUTCOMES:

CLO 1.	Classify invertebrates
CLO 2.	Relate between the phyla through phylogenic comparison
CLO 3.	Interpret the concept of ecosystem and its types
CLO 4.	Evaluate the interdependence and interactions between abiotic and biotic factors in

	the environment
CLO 5.	Relate the dynamics of population ecology with its various parameters

UNIT 1	**Classification of Animal Kingdom (15 LECTURES)**
1.1	Unicellular organization: Phylum Protozoa
1.2	Multicellular organization: 1.2.1: Colonization level - Phylum Porifera 1.2.2: Division of labour – Phylum Cnidaria
1.3	Triploblastic acoelomate and pseudocoelomate organization 1.3.1: Acoelomate organization – Phylum Platyhelminthes 1.3.2: Pseudocoelomate organization – Phylum Nemathelminthes
1.4	Triploblastic Coelomate organization 1.4.1: Animals with metameric segmentation: Phylum Annelida 1.4.2: Animals with jointed appendages: Phylum Arthropoda 1.4.3: Animals with mantle: Phylum Mollusca 1.4.4: Animals with enterocoel: Phylum Echinodermata
UNIT 2	**Ecosystem (15 LECTURES)**
2.1	Concept of ecosystems 2.1.1: Definition and components
2.2	Biogeochemical cycles 2.2.1: Water, Oxygen, Nitrogen, Sulphur
2.3	Freshwater ecosystem 2.3.1: Lentic 2.3.2: Lotic
2.4	Food chains and food webs in ecosystems 2.4.1: Freshwater 2.4.2: Grassland
2.5	Ecological pyramids of energy, biomass and number
2.6	Animal interactions: 2.6.1: Commensalism 2.6.2: Mutualism 2.6.3: Predation 2.6.4: Parasitism 2.6.5: Antibiosis
UNIT 3	**Population Ecology (15 LECTURES)**
3.1	Population Dynamics 3.1.1: Population density, Natality, Mortality 3.1.2: Fecundity, Age structure, Sex ratio

	3.1.3: Survivorship curves 3.1.4: Population dispersal and distribution patterns 3.1.5: Niche concept
3.2	Population growth regulation 3.2.1: Intrinsic mechanism – Density dependent fluctuations and oscillations 3.2.2: Extrinsic mechanisms – Density dependent, environmental and climatic factors 3.2.3: Population interaction
3.3	Population growth pattern 3.3.1: Sigmoid 3.3.2: 'J' shaped

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2. Dash, M.C. (1993). *Fundamentals of Ecology*. (2nd ed.). Tata McGraw Hill.

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NAME OF THE COURSE	APPLIED BIOLOGY	
CLASS	FYBSC ZOOLOGY	
COURSE CODE	US.ZOO.1.02	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	3	
TOTAL NUMBER OF LECTURES PER SEMESTER	45	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	25	75
PASSING MARKS	10	30

COURSE OBJECTIVES:

CO 1.	To make learners aware of good laboratory practices.
CO 2.	To understand the concepts of measurements.
CO 3.	To understand applications of biostatistics.
CO 4.	To acquaint learners to the modern developments in the field of animal biotechnology
CO 5.	To provide all learners a complete insight about the structure and working of different instruments used in Zoology
CO 6.	To impart hands on operational skills

COURSE LEARNING OUTCOMES:

CLO 1.	Translate the good laboratory practices ensuring their safety and precision in the laboratory during practical sessions
CLO 2.	Demonstrate the measurements in terms of micro and macro quantities of chemical concentrations
CLO 3.	Apply biostatistical tools for data analysis
CLO 4.	Relate the recent advances in biotechnology with their applications for the betterment of mankind
CLO 5.	Translate the instrumentation principles through skills acquired by hands-on experiment

UNIT 1	**Laboratory Safety and Units of Measurement (15 LECTURES)**
1.1	Introduction to good laboratory practices
1.2	Use of safety symbols: meaning, types of hazards and precautions
1.3	Units of measurement: 1.3.1: Calculations and related conversions of each: Metric system- length (meter to micrometer), weight (gram to microgram), Volumetric (Cubic measures) 1.3.2: Temperature: Celsius, Fahrenheit, Kelvin 1.3.3: Biostatistics: Introduction and scope, Sampling and its types, Central tendencies (mean, median, mode), Tabulation, Graphical representations (Histograms, bar diagrams, pie diagrams).
UNIT 2	**Animal Biotechnology (15 LECTURES)**
2.1	Biotechnology: Scope and achievements of Biotechnology (Fishery, Animal Husbandry, Medical, Industrial)
2.2	Transgenesis: Retroviral vector method, Nuclear transplantation method, DNA microinjection method and Embryonic stem cell method
2.3	Cloning (Dolly)
2.4	Ethical issues of transgenic and cloned animals
2.5	Applications of Biotechnology: 2.5.1: DNA fingerprinting: Technique in brief and its application in forensic science (Crime Investigation) 2.5.2: Recombinant DNA in medicines (recombinant insulin) 2.5.3: Gene therapy: Ex-vivo and *In vivo,* Severe Combined Immunodeficiency (SCID), Cystic Fibrosis 2.5.4: Green genes: Green Fluorescent Protein (GFP) from Jelly fish-valuable as reporter genes used to detect food poisoning.
UNIT 3	**Instrumentation (15 LECTURES)**
3.1	Microscopy - Construction, principle and applications of dissecting and compound microscope
3.2	Colorimetry and Spectroscopy - Principle and applications

3.3	pH - Sorenson's pH scale, pH meter - principle and applications
3.4	Centrifugation - Principle and applications (clinical and ultra centrifuges)
3.5	Chromatography - Principle and applications (Partition and Adsorption)
3.6	Electrophoresis - Principle and applications (AGE and PAGE)

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PRACTICAL COURSE US.ZOOP.1
PRACTICAL I

1.Classification of Animal Kingdom

    1.1: Protozoa : *Amoeba, Paramoecium, Euglena, Plasmodium*

    1.2: Porifera: *Leucosolenia, Euplectella*, Bath sponge

    1.3: Coelenterata: *Hydra*, *Obelia* colony, *Aurelia,* Sea anemone

    1.4: Platyhelminthes: *Planaria*, Liverfluke, Tapeworm

    1.5: Nemathelminthes: *Ascaris* – male and female

    1.6: Annelida: *Nereis*, Earthworm, Leech

    1.7: Arthropoda: Crab, lobster, dragonfly, butterfly, spider, scorpion, centipede, millipede

    1.8: Mollusca: *Chiton, Dentalium, Pila, Unio, Sepia, Nautilus*

    1.9: Echinodermata: Starfish, brittle star, feather star, sea urchin, sea cucumber

2. Study of *Paramoecium* culture to observe food vacuole, contractile vacuole and ciliary movement

3. Determination of population density (*Daphnia* or any other suitable organism) by sub-sampling method.

4. Mounting of foraminiferan shells from sand.

5. Study of parapodium of *Nereis.*

6. Mouthparts of insects – Biting and chewing, piercing and sucking, siphoning, sponging

7. Study of food webs and food chains in an ecosystem - To be conducted using Research based pedagogy (students to present their study through PPT / Chart presentations).

8. Field report on excursion to Nature Park / Zoological garden.

PRACTICAL II

1. Study of instruments used in the lab – Principle and working of:

    a. Colorimeter

    b. Centrifuge

    c. Spectroscopy

    d. Compound microscope

    e. Dissecting microscope

2. Interpretation of safety symbols (toxic, corrosive, explosive, flammable, skin irritant, oxidizing, compressed gases, aspiration hazards and biohazardous infectious material).

3. Study of aseptic techniques to aseptically transfer culture media.

4. Separation of pigments by adsorption chromatography using chalk.

5. Separation of amino acids using paper chromatography.

6. Separation of lipids by TLC.

7. Study of Beer- Lambert law using different concentrations of coloured solutions.

8. Estimation of pH of different solutions using BDH indicator, red cabbage and pH paper.

9. Identification of transgenic fish (Trout and Salmon) / cloned animals (Dolly sheep, CC cat and Snuppy dog) from photograph.

10. Application of DNA Fingerprinting in criminology (photograph of electrophoretic pattern to be given for interpretation by the students.

11. Study of central tendencies and plotting of bar diagram, histogram and pie diagram.

ASSESSMENT DETAILS:(This will be same for all the theory papers)

Maximum Marks allotted for each theory course per semester: 100 marks

(a) Internal assessment of total of twenty-five (25) marks per course per semester shall be conducted as: out of 20 marks based on the test / project and out of 5 marks based on the active participation in the class.
(b) Semester End Examination – External Assessment (75 marks)

Practical Assessment (for papers with practicals)

Maximum Marks allotted for the entire practical course per semester: 100 marks which will be distributed into the following two examination sessions and conducted as per the given question paper pattern:

(a) Practical I examination of fifty (50) marks shall be conducted at the end of every semester.
(b) Practical II examination of fifty (50) marks shall be conducted at the end of every semester.
(c) The duration of the practical exam will be two and half hours.

PAPER PATTERN OF INTERNAL ASSESSMENT TEST

All Questions are compulsory
Figures to the right indicate full marks

Time: 50 minutes   **Total marks: 20**

Q.1.	Objective type questions	05 marks
Q.2.	Answer in one sentence OR Define the following	05 marks
Q.3.	Answer any two out of three (05 marks each)	10 marks

PAPER PATTERN OF THEORY EXTERNAL ASSESSMENT

All Questions are compulsory
Figures to the right indicate full marks

Time: 2.5 hours   **Total marks: 75**

Q.1.	Based on UNIT 1 a. Answer any one of the two (10 marks) b. Answer any two out of the four (5 marks each)	20 marks
Q.2.	Based on UNIT 2 a. Answer any one of the two (10 marks) b. Answer any two out of the four (5 marks each)	20 marks
Q.3.	Based on UNIT 3 a. Answer any one of the two (10 marks) b. Answer any two out of the four (5 marks each)	20 marks
Q.4.	Based on all three units – two from each unit Answer any three out of six (5 marks each)	15 marks

PAPER PATTERN OF PRACTICAL EXAMINATION
US. ZOOP.1

PRACTICAL I EXAMINATION

Duration : 2 hrs30 min   **Marks: 50**

Q. 1. Prepare the temporary mounting of foraminiferan shells and identify minimum three types.
                                                                                           (10 Marks)
    OR
Q.1. Prepare the temporary mounting of parapodium of *Nereis.*   (10 Marks)

Q.2. Determine of population density of the given organism by sub-sampling method (10 Marks)

    OR
Q.2. Demonstrate the observations of food vacuole, contractile vacuole and ciliary movement of
    Paramoecium from the given culture.   (10 Marks)

Q.3. Identification based on animal classification and mouthparts of insects. (A-E)   (15 Marks)

Q.5.Field study report and viva on it.   (10 Marks)

Q.4. Certified journal   (05 Marks)

PRACTICAL II EXAMINATION
Duration: 2 hrs. 30 min   **Marks: 50**
Q.1. Estimate concentration of the given unknown solution using colorimeter from
the standard as well as calculations.   (15 marks)
    OR
Determine pH of the given samples with the help of the given indicators and pH meter and comment on their
chemical nature.   (15 marks)
    OR
Q. 2. Perform experiment for separation of pigments by adsorption chromatography.   (10Marks)
    OR
Perform experiment for separation of mixture of amino acids by paper chromatography   (10Marks)
    OR
Perform Thin Layer Chromatography (TLC) for separation of lipids.   (10Marks)

Q. 3. Prepare a frequency distribution table / Plot histogram / Pie diagram / Bar diagram from
the given data.   (5 marks)
    OR
 Demonstrate aseptic technique to transfer culture media   (5 Marks)

Q. 4. Identification (A-E)   (10 Marks)
(Safety Symbols (two), lab instruments, transgenic animals, DNA fingerprinting)

Q.5. Certified journal & Viva based on practicals   (10 Marks)

SEMESTER II

NAME OF THE COURSE	BIODIVERSITY, EVOLUTION AND ETHOLOGY	
CLASS	FYBSC ZOOLOGY	
COURSE CODE	US.ZOO.1.02	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	3	
TOTAL NUMBER OF LECTURES PER SEMESTER	45	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	25	75
PASSING MARKS	10	30

COURSE OBJECTIVES:

CO 1.	To make learners aware of current status of wild life conservation in India
CO 2.	To introduce the concept of origin of life on earth
CO 3.	To gain knowledge about the animal behaviour and its types

COURSE LEARNING OUTCOMES:

CLO 1.	Examine the scenario of wild life conservation in India in the light of guidelines from different relevant governing agencies vis-à-vis with adversity of poaching and biopiracy
CLO 2.	Evaluate different processes of evolution through various theories and evidences
CLO 3.	Analyze and compare different types of animal behaviour

UNIT 1	National Parks and Sanctuaries (15 LECTURES)
1.1	1.1 Concept of endangered and critically endangered species using examples of Indian Wildlife with respect to National Parks and Wildlife Sanctuaries of India 1.1.1: Sanjay Gandhi National Park 1.1.2: Tadoba Tiger Reserve 1.1.3: Corbett National Park 1.1.4: Kaziranga National Park 1.1.5: Gir National Park 1.1.6: Silent Valley 1.1.7: Pirotan Island Marine Park 1.1.8: Ghana National Park 1.1.9: Bandipur Sanctuary
1.2	1.2 Management strategies with special reference to Tiger and Rhinoceros in India 2.2.1: Project Tiger 2.2.2: Project Rhinoceros
1.3	Ecotourism
1.4	Biopiracy
UNIT 2	Evolution (15 LECTURES)
2.1	Introduction: Origin of universe, Chemical evolution - Miller-Urey experiment, Haldane and Oparin theory
2.2	Origin of life, Origin of eukaryotic cell
2.3	Geological Time Scale
2.4	Evidences in favour of organic evolution: Geographical distribution, Paleontology Anatomy, Embryology, Physiology and Genetics.
2.5	Theories of organic evolution 2.5.1: Theory of Lamarck 2.5.2: Theory of Darwin and Neo Darwinism 2.5.3: Mutation Theory 2.5.4: Modern Synthetic Theory 2.5.5: Weismann's Germplasm Theory 2.5.6: Neutral Theory of Molecular Evolution
UNIT 3	Ethology (15 LECTURES)
3.1	Development of behaviour: 3.1.1: Ontogeny of behavior 3.1.2: Environmental influence on behaviour 3.1.3: Sensitive periods during development

		3.1.4: Juvenile behavior 3.1.5: Innate behavior
3.2		Animal Learning: 3.2.1: Conditioning and learning 3.2.2: Classical Conditioning, acquisition, extinction 3.2.3: Habituation and generalization 3.2.3: Instrument learning, 3.2.4: Reinforcement, Operant behavior
3.3		Biological aspects of learning
3.4		Constraints of learning: 3.4.1: Learning to avoid enemies, mimicry 3.4.2: Learning to avoid sickness 3.4.3: Stimulus relevance
3.5		Cognitive aspects of learning: 3.5.1: Hidden Nature of conditioning 3.5.2: Nature of cognitive process 3.5.3: Insight learning 3.5.4: Associative learning and representation

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NAME OF THE COURSE	GENETICS AND BIOCHEMISTRY	
CLASS	FYBSC ZOOLOGY	
COURSE CODE	US.ZOO.1.02	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	3	
TOTAL NUMBER OF LECTURES PER SEMESTER	45	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	25	75
PASSING MARKS	10	30

COURSE OBJECTIVES:

CO 1.	To introduce the learner to the basic terms and concepts of genetics.
CO 2.	To understand Mendelian and other types of inheritance and applications of genetics
CO 3.	To gain knowledge about the structure and function of the biomolecules
CO 4.	To make learners understand the importance of balanced diet and essential nutrients of food at different stages of life.
CO 5.	To become aware of the various national community health programs

COURSE LEARNING OUTCOMES:

CLO 1.	Apply the principles of inheritance for various case studies
CLO 2.	Assess the applications of genetics in real life situations
CLO 3.	Recall the classification and structures of biomolecules and their clinical significance
CLO 4.	Relate the concept of balanced diet with healthy dietary habits and importance of a healthy life style
CLO 5.	Enlist the various benefits of the national health programs towards betterment of public health

UNIT 1	Genetics (15 LECTURES)
1.1	Introduction to genetics: 1.1.1: Definition, scope and importance of genetics 1.1.2: Classical and Modern concept of Gene 1.1.3: Explanation of terms: Allele, wild type and mutant alleles, locus, dominant and recessive traits, genotype and phenotype, homozygous and heterozygous
1.2	Mendelian Inheritance: 1.2.1: Monohybrid and Dihybrid cross 1.2.2: Test cross and Back cross 1.2.3: Exceptions to Mendelian inheritance: Incomplete dominance, Co-dominance, Lethal alleles, Epistasis and its types
1.3	Pedigree analysis: Autosomal dominant and recessive, sex-linked dominant and recessive traits.
1.4	Genetic Counselling: Risk of recurrence of hereditary diseases, causes and significance of genetic counseling.
1.5	Cytoplasmic Inheritance: Kappa particles in *Paramoecium*, Sigma factor in *Drosophila,* Shell coiling in Gastropoda.
UNIT 2	Biochemistry (15 LECTURES)
2.1	Biomolecules: Concept of Micromolecules and Macromolecules and their significance
2.2	Carbohydrates 2.2.1: Definition Classification, Properties and Isomerism, Glycosidic bond 2.2.2: Structure of Monosaccharides- Glucose, Galactose and Fructose 2.2.3: Disaccharides –Maltose, Lactose and Sucrose 2.2.4: Polysaccharides - Cellulose, Starch, Glycogen and Chitin 2.2.5: Biological role and their Clinical significance
2.3	Amino Acids and Proteins 2.3.1: Basic structure of amino acid, Classification of amino acids, Essential and Non-essential amino acids 2.3.2: Peptide bond 2.3.2: Protein conformation: Primary, Secondary, Tertiary, and Quaternary 2.3.4: Biological role of proteins and their Clinical significance
2.4	Lipids 2.4.1: Definition, Saturated and Unsaturated fatty acids, Essential fatty acids 2.4.2: Ester linkage and Classification of lipids with examples, 2.4.3: Structure of Triacylglycerides, Phospholipids (Lecithin and Cephalin) and Cholesterol 2.4.4: Biological role and their Clinical significance

UNIT 3	**Nutrition and Public Health (15 LECTURES)**
3.1	Concept of balanced diet, dietary recommendation to a normal adult, infant, pregnant women and aged, importance of fibres in food.
3.2	Concept of Health: 2.2.1: Definition of health, need for health education and health goals 2.2.2: Physical, Psychological and Social health issues 2.2.3: WHO and its programmes – Polio, Small pox, Malaria and Leprosy
3.3	Malnutrition disorders and their status in India – Anaemia, Rickets, Marasmus, Goiter, Kwashiorkor
3.4	Obesity, BMI calculation and its significance
3.5	Stress related disorders: Hypertension, Anxiety, Insomnia, Migraine, Depression, Psoriasis (causes, symptoms, precaution and remedy).

REFERENCES:

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PRACTICAL COURSE US.ZOOP.2

PRACTICAL I

1. Study of national parks, sanctuaries and bio reserves in India with respect to its brand fauna as listed in theory.

2. Study of endangered / critically endangered species in India.

3. Project submission on any of the conservation efforts carried out by the Indian Government (E.g. Project Tiger, Project Rhinoceros etc.). Students will present a PPT presentation on the chosen topic.

4. Study of identification of homologous and analogous organs as evidences of evolution.

5. Study of Ecotourism with the help of case studies:

    a. Garhwal region

    b. Konkan region

6. Study of ethology:

    a. Classical conditioning

    b. Juvenile behavior in animals

    c. Innate behavior

    d. Instrument learning

    e. Learning to avoid enemies, mimicry

    f. Learning to avoid sickness

    g. Insight learning

7. Study of biodiversity hotspots in India (Western Ghats and Indo- Burma).

8. Identification and study of fossils:

    a. Arthropods: Trilobite

    b. Mollusca: Ammonite

    c. Aves: Archaeopteryx

9. Field report based on study excursion.

PRACTICAL II

1. Qualitative tests for carbohydrates (Molisch's test, Benedict's test, Barfoed's test, Anthrone test).

2. Qualitative tests for protein (Ninhydrin test, Biuret test, Xanthoproteic test).

3. Qualitative test for lipids (Solubility test, Sudan III test).

4. Study of rancidity of lipid by titrimetric method.

5. PPT presentations by students on clinical disorders due to carbohydrates, proteins and lipids imbalance.

   (Photograph to be provided / significance to given and disorder to be identified).

   a. Hyperglycemia, Hypoglycemia and Diabetes

   b. Kwashiorkor, Marasmus

   c. Obesity, Atherosclerosis

   d. Thalassemia, Anaemia

   e. Goiter, Rickets

6. Problems in genetics based on monohybrid and dihybrid ratios.

7. Problems based on analysis of pedigree charts - Autosomal dominant and recessive, sex-linked dominant and recessive traits.

8. BMI analysis – Measurement of height and weight (50 readings) and calculation of BMI and report submission based on analysis of the result obtained.

ASSESSMENT DETAILS:(This will be same for all the theory papers)

Maximum Marks allotted for each theory course per semester: 100 marks

   (a) Internal assessment of total of twenty-five (25) marks per course per semester shall be conducted as: out of 20 marks based on the test / project and out of 5 marks based on the active participation in the class.
   (b) Semester End Examination – External Assessment (75 marks)

Practical Assessment (for papers with practicals)

Maximum Marks allotted for the entire practical course per semester: 100 marks which will be distributed into the following two examination sessions and conducted as per the given question paper pattern:

   a) Practical I examination of fifty (50) marks shall be conducted at the end of every semester.

b) Practical II examination of fifty (50) marks shall be conducted at the end of every semester.

- The duration of the practical exam will be two and a half hours.
- The students are allowed to write the paper if the attendance for practicals is more than 75%
- To appear in the practical exam, students must bring a properly certified journal.

PAPER PATTERN OF INTERNAL ASSESSMENT TEST

All Questions are compulsory
Figures to the right indicate full marks

Time: 50 minutes   **Total marks: 20**

Q.1.	Objective type questions	05 marks
Q.2.	Answer in one sentence OR Define the following	05 marks
Q.3.	Answer any two out of three (05 marks each)	10 marks

PAPER PATTERN OF THEORY EXTERNAL ASSESSMENT

All Questions are compulsory
Figures to the right indicate full marks

Time: 2 hrs. 30 min   **Total marks: 75**

Q.1.	Based on UNIT 1 a. Answer any one of the two (10 marks) b. Answer any two out of the four (5 marks each)	20 marks
Q.2.	Based on UNIT 2 a. Answer any one of the two (10 marks) b. Answer any two out of the four (5 marks each)	20 marks
Q.3.	Based on UNIT 3 a. Answer any one of the two (10 marks) b. Answer any two out of the four (5 marks each)	20 marks
Q.4.	Based on all three units – two from each unit Answer any three out of six (5 marks each)	15 marks

PAPER PATTERN OF PRACTICAL EXAMINATION
US.ZOOP.2

PRACTICAL I EXAMINATION

Duration : 2 hrs. 30 min   **Marks: 50**

Q.1. Identify brand animals (Min. 4) and place them in their respective National parks/ Sanctuaries
on the given map quoting reasons for their decline.   (10 Marks)
    OR
Mark National parks and Sanctuaries on the map of India and mention the name of their
brand animals stating reason for their decline. (Min. 4)   (10 Marks)

Q.2. Project report conservation efforts of wildlife conservation by the Indian government and viva based on it.
    (10 marks)

Q.3. Identification on ethology, evidences of evolution, fossils. (A-E)   (10 marks)

Q.4. Field report & Viva   (10 marks)

Q.5. Journal & Viva based on practicals   (10 marks)

PRACTICAL II EXAMINATION

Time: 2 hrs. 30 min   **Marks: 50**

Q.1. Perform the qualitative tests for carbohydrates.   (15 marks)
  OR
Q.1 Estimate the rancidity of given lipid sample by titrimetric method.   (15 marks)
  OR
Q.1. Perform the qualitative tests for protein and lipids.   (15 marks)
Q.2. Solve the given genetics problems   (5 marks)
Q.3. Analyze the given pedigree chart / construct the pedigree chart based
on the information.   (05 marks)

Q.4. Submission of report on survey of BMI and viva on it   (05 marks)

Q.5. Identification (Clinical disorders)   (10 marks)

Q.6. Journal & Viva based on practicals   (10 marks)