

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Syllabus for S.Y.B.Sc.
(June 2020 Onwards)

Program: B.Sc.
Semester – III and IV
Course: Zoology

SEMESTER -III

Course Code	Paper Title	Credit
SZO301	Fundamentals of Genetics, Chromosomes and Heredity, Nucleic acids	02
SZO302	Nutrition and Excretion, Respiration and circulation, Control and coordination of Life Processes, Locomotion and Reproduction	02
SZO303	Ethology, Parasitology, Economic Zoology	02
SZOP301	Practical based on Paper I: Course 5	01
SZOP302	Practical based on Paper II: Course 6	01
SZOP303	Practical based on Paper III: Course 7	01

SEMESTER-IV

Course Code	Paper Title	Credit
SZO401	Origin and Evolution of Life, Population Genetics and Evolution, Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research	02
SZO402	Cell Biology, Endomembrane System and Biomolecules	02
SZO403	Comparative Embryology, Aspects of Human Reproduction, Pollution and its effects on organisms	02
SZOP401	Practical based on Paper I: Course 8	01
SZOP402	Practical based on Paper II: Course 9	01
SZOP403	Practical based on Paper III: Course 10	01



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

1. Syllabus as per Choice Based Credit System

- i) Name of the Programme : S.Y.B.Sc. Zoology
- ii) Course Code : **Semester- III**
SZO301 (Course 5), SZO302 (Course 6) and
SZO303 (Course 7)
Semester-IV
SZO401 (Course 8), SZO402 (Course 9) and
SZO403 (Course 10)
- iii) Course Title : Zoology
- iv) Semester-wise Course Contents : Copy of the Syllabus enclosed
- v) References and Additional References : Enclosed in the Syllabus
- vi) Credit Structure
- | | |
|-----------------------------|----|
| No. of Credits per Semester | 09 |
|-----------------------------|----|
- vii) No. of lectures per Unit 15
- viii) No. of lectures per week 09
- ix) No. of Tutorial per week :--
- x) No. of practical per week : 03 (per batch)

2. Scheme of Examination

: Internal Assessment (40marks):

Class Test: 20 marks,

Assignment: 15 marks

Class Participation: 05 marks

External Assessment (60 marks)

Semester End Exam:

Objectives: 12Marks

Subjective: 12 Marks -One question each

from 3 Units / Two questions of 6 marks

each from 3 units 12 Marks -Two questions

each from 3 Units (Any 4 out of 6)

3. Special notes, if any

: No

4. Eligibility, if any

: As laid down in the College

Admission brochure/website

5. Fee Structure

: As per College Fee Structure

specifications

6. Special Ordinances / Resolutions, if any :No

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Programme:S.Y.B.Sc.

Semester:III

Course: Zoology- I(Course5)

Course code:SZO301

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
6	-	1	3	20	15	05		-	60	100
Max. Time, End Semester Exam (Theory) - 2Hrs.										

Prerequisite 1. Basic knowledge about Zoology
 2. Curiosity regarding aspects of the animal kingdom

Course Objectives

1. To develop the learner's understanding about the genetic basis of life.
2. To study Mendelian principles of inheritance and other patterns inheritance
3. To help learners learn about variations in traits and how they are passed on.
4. To develop the learner's understanding about the central dogma
5. To familiarize the learner with the concept of gene regulation

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

SEMESTER III
Course Content

Unit No.	Module No.	Content	Lectures
		SZO301 (Paper I Course 5): Fundamentals of Genetics, Chromosomes and Heredity, Nucleic acids	
1	I,II,III, IV	<p>Fundamentals of Genetics</p> <p>I. Introduction to genetics Definition, scope and importance of genetics, Classical and Modern concept of Gene (Cistron, muton, recon), Brief explanation of the following terms: Allele, wild type and mutant alleles, locus, dominant and recessive traits, homozygous and heterozygous, genotype and phenotype, genome.</p> <p>II. Mendelian Genetics Mendelian Genetics: Monohybrid cross, Dihybrid cross, test cross, back cross, Mendel's laws of Inheritance, Mendelian traits in man, Exceptions to Mendelian Inheritance: Incomplete dominance, Co-dominance, Lethal alleles, Epistasis Recessive, Double recessive, dominant and double dominant, Chromosome theory of inheritance, Pedigree analysis - Autosomal dominant and autosomal recessive, X-linked dominant, and X-linked recessive.</p> <p>III. Multiple Alleles and Multiple Genes Concept of multiple alleles, Coat colour in rabbit, ABO and Rh blood group systems, Polygenic inheritance with reference to skin colour and eye colour in man, Concept of Pleiotropy</p> <p>IV. Linkage and Crossing over Linkage and crossing over, Types of crossing over, Cytological basis of crossing over</p>	15
2	I,II,III	<p>Chromosomes and Heredity</p> <p>I. Chromosomes Types of chromosomes–Autosomes and Sex chromosomes, Chromosome structure - Heterochromatin, Euchromatin, Classification based on the position of centromere, Endomitosis, Giant chromosomes - Polytene and Lamp brush chromosomes and significance of Balbiani rings.</p> <p>II. Sex-determination Chromosomal Mechanisms: XX-XO, XX-XY, ZZ-ZW, Sex determination in honey bees - Haplodiploidy, Sex determination in <i>Drosophila</i>-Genic balance theory, intersex,</p>	15



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

		<p>gynandromorphs, Parthenogenesis, Hormonal influence on sex determination - Freemartin and sex reversal, Role of environmental factors - <i>Bonellia</i> and Crocodile, Barr bodies and Lyon hypothesis</p> <p>III. Sex linked, sex influenced and sex limited inheritance. X-Linked: Colourblindness, Haemophilia, Y-linked: Hypertrichosis, Sex-influenced genes, Sex limited genes</p>	
3	I,II,III	<p>Nucleic Acids</p> <p>I. Genetic material Griffith's transformation experiments, Avery-Macleod and McCarty, Hershey Chase experiment of Bacteriophage infection, Chemical composition and structure of nucleic acids, Double helix nature of DNA, Solenoid model of DNA, Types of DNA – A, B, Z forms, DNA in Prokaryotes -chromosomal and plasmid, Extra nuclear DNA -mitochondria and chloroplast, RNA as a genetic material in viruses, Types of RNA: Structure and function.</p> <p>II. Flow of genetic information in an Eukaryotic cell Central Dogma, DNA Replication in eukaryotic cells, Introduction to transcription and translation.</p> <p>III. Gene Expressions and regulation Concept of operon, Lac operon.</p>	15
		Total No. of Lectures	45

Beyond the syllabus

Tutorial activities: Student's presentations, Use of E-learning and M-learning, Use of animations.

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

SZOP301 (SEMESTER III)
Based on PAPER I COURSE 5

List of experiments	
Sr. No.	Description
1	Extraction and detection of DNA
2	Extraction and detection of RNA.
3	Mounting of Barr bodies.
4	Study of polytene chromosome.
5	Study of mitosis- temporary squash preparation of Onion root tip
6	Detection of blood groups and Rh factor.
7	Problems in Genetics a) Monohybrid/ Dihybrid cross b) X- linked inheritance c) Multiple alleles
8	Chromosome morphology: Metaphase spreadsheet (photograph to be provided)
9	Pedigree analysis
10	Problems on molecular biology

Semester III - Fundamentals of Genetics, Chromosomes and Heredity, Nucleicacids - SZO301 (Paper I:Course 5) (Internal AssessmentPattern)	
Duration:	Marks: 40
1. Class Test (Based on theory unit 1,2,3)	20 Marks
2. Assignment	15 Marks
3. Class participation and overall conduct	05 Marks

Semester III - Fundamentals of Genetics, Chromosomes and Heredity, Nucleicacids - SZO301 (Paper I:Course 5) (Internal Class Test PaperPattern)	
Duration:	Marks: 20
Q.1. a) Fill in the blanks (1 or 2 questions each from unit1,2,3)	05 Marks
b) Match the column (1 or 2 questions each from unit1,2,3) Column A 1. 2. 3. 4. 5. Column B a) b) c) d) e)	05 Marks
Write short note on: (Any two) 1. Unit1 2. Unit2 3. Unit3	10 Marks

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Semester III - Fundamentals of Genetics, Chromosomes and Heredity, Nucleicacids - SZO301 (Paper I:Course 5) (Theory PaperPattern)	
Duration: 2 hrs	Marks: 60
Q.1. a) Fill in the Blanks: (2-3 questions from each Unit) 1. 2. 3. 4. 5. 6. 7. 8.	04 Marks
b) Match the column: (2-3 questions from each Unit) Column A 1. 2. 3. 4. 5. 6. 7. 8. Column B a) b) c) d) e) f) g) h)	04 Marks
Q.1. c) Define: Answer in one sentence: (One/Two from each Unit) 1. 2. 3. 4.	04 Marks
Unit1 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Unit 2 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Q.4. Unit 3 a) Answer the following: (12 marks each) OR a) Answer in brief: (6Marks) b) Answer in brief: (6Marks)	12 Marks



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Q.5. Write Short notes on: (Any four) 2 questions from each Unit a) b) c) d) e) f)	12 Marks
--	----------

Semester III - Fundamentals of Genetics, Chromosomes and Heredity, Nucleicacids - SZOP301 (Paper I:Course 5) (Practical PaperPattern)	
Duration: 5 hrs	Marks: 50
Major Question Q1. Extraction and detection of DNA OR Q1. Extraction and detection of RNA	15 Marks
Minor Question Q2. Mounting of Barr bodies OR Q2. Study of mitosis-Temporary squash preparation of Onion root tip OR Q2. Detection of blood groups and Rh factor	07 Marks
Q3. Problems on Genetics and Molecular biology (Transcription /Genetic code) (01 problem each)	10 Marks
Q4. Identification a. Chromosome morphology b. Pedigree analysis	08 Marks
Q5. Viva and Journal	10 Marks

Course Outcome
After the completion of the course, students will able to
CO1 understand and apply the principles of inheritance, multiple alleles and crossing over
CO2 understand the structure and types of chromosomes.
CO3 correlate the disorders linked to a particular sex chromosome.
CO4 understand the importance of nucleic acids as genetic material
CO5 be acquainted with the knowledge of the regulation of gene expressions.

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Recommended Resources

1. Principles of Genetics. Gardner, E.J., Simmons, M.J and Snustad, D.P. John Wiley and Sons
2. Concepts of Genetics. Klug, W.S., Cummings M.R., Spencer, C.A. Benjamin Cummings
3. Genetics- A Molecular Approach. Russell, P. J Benjamin Cummings
4. Genetics: Analysis of Genes and Genomes. Daniel L., Hartl, Elizabeth W. Jones Jones & Bartlett Publishers
5. Introduction to Genetic Analysis. Griffiths, A.J.F., Wessler. S.R., Lewontin, R.C. and Carroll, S.B. W.H. Freeman and Co
6. Cell Biology Genetics, Molecular Biology Evolution and Ecology Verma P.S. and Agrawal P.K., 9th edition, S. Chand Publication, New Delhi
7. Principles of Genetics – Eight edition- Eldon John Gardner, Michael J. Simmons, D. Peter Snustad
8. Genetics- Weaver, Hedrick, third edition, McGraw Hill Education
9. Genetics A Mendelian approach Peter J. Russel, Pearson Benjamin Cummings
10. Genetics A conceptual approach, Benjamin A. Pierce, Southwestern University, W.H. Freeman and company, New York
11. Genetics, Third Edition, Monroe W. Strickberger
12. Genetics from gene to genome, third edition, Leeland H. Hartwell, Leeroy Hood, Michael 7. L. Goldberg, Ann E. Reynolds, Lee M. Silver, McGraw Hill Education

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Programme:S.Y.B.Sc.

Semester:III

Course: Zoology- II(Course6)

Course code:SZO302

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
6	-	1	3	20	15	05		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite 1. Basic knowledge about Zoology
 2. Curiosity regarding various aspects of the animal kingdom

Course Objectives

1. To introduce the concepts of physiology of nutrition, excretion and osmoregulation.
2. To expose the learners to various nutritional apparatus, excretory and osmoregulatory structures in different classes of organisms.
3. To expose the learners to various respiratory and circulatory structures in different classes of organisms.
4. To introduce the concepts of physiology of control and coordination, locomotion, reproduction.
5. To expose the learners to various locomotory and reproductive structures in different classes of organisms.

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

SEMESTER III
Course Content

Unit No.	Module No.	Content	Lectures
		<u>SZO302</u>(Paper II Course 6): Nutrition and Excretion, Respiration and circulation, Control and coordination of Life Processes, Locomotion and Reproduction	
1	I,II,III, IV,V	Study of Nutrition and Excretion I. Comparative study of Nutritional Apparatus (structure and function): Amoeba, Hydra, Earthworm, Cockroach, Bivalve, Amphioxus, Pigeon, Ruminants II. Physiology of Digestion in Man III. Comparative study of Excretory and Osmoregulatory structures and function a. Amoeba -contractile vacuoles b. Planaria -Flame cells c. Earthworm-Nephridia d. Cockroach- Malpighian tubules e. Bivalve - Organ of Bojanus IV. Categorization of animals based on principle nitrogenous excretory Products V. Structure of kidney, Uriniferous tubule and physiology of urine formation in man.	15
2	I,II,III, IV,V, VI,VII	Study of Respiration and Circulation I. Comparative study of Respiratory organs (structure and function) Earthworm, Spider, Rohu, Frog and Pigeon. II. Accessory respiratory structures Anabas /Clarias III. Structure of lungs and physiology of respiration in man IV. Comparative study of circulation: Open and closed- Single and Double V. Types of circulating fluids- Water, coelomic fluid, haemolymph, lymph and blood. VI. Comparative study of Hearts (Structure and function) Earthworm, Cockroach, Shark, Frog, Crocodile and Pigeon VII. Structure and mechanism of working of heart in man	15

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

3	I,II,III, IV	<p>Control and coordination, Locomotion and Reproduction</p> <p>I. Control and coordination Irritability – <i>Paramoecium</i>, Nerve net in Hydra, Nerve ring and nerve cord in earthworm, Types of neurons on the basis of structure and function, Conduction of nerve impulse: Resting potential, action potential and refractory period, Synaptic transmission, Endocrine regulation: Hormones as chemical messengers, positive and negative feedback mechanisms</p> <p>II. Movement and Locomotion Locomotory organs - structure and function - a. Pseudopodia in Amoeba (sol gel theory), Cilia in Paramecium, b. Wings and legs in Cockroach, c. Tube feet in Starfish, d. Fins of fish</p> <p>III. Structure of Striated muscle fibre in human and Sliding filament theory</p> <p>IV. Reproduction Asexual Reproduction- Fission, fragmentation, gemmule formation, budding, Sexual reproduction - Gametogenesis, Structure of male and female gametes in human, Types of fertilization, Oviparity, viviparity, ovo-viviparity</p>	15
---	-----------------	---	----

Beyond the syllabus

Tutorial activities: Student's presentations, Use of E-learning and M-learning, Use of animations, Workshops.

SZOP302 (SEMESTER III)
Based on Paper II- Course 6

List of experiments

Sr. No.	Description
1	Urine analysis—Normal and abnormal constituents
2	Detection of ammonia in water excreted by fish
3	Detection of uric acid from excreta of Birds
4	Study of striated and non-striated muscle fibre
5	Study of nutritional Apparatus (<i>Amoeba</i> , <i>Hydra</i> , Earthworm, Pigeon, Ruminant, stomach)
6	Study of food and feeding mechanism in <i>Paramecium</i> .
7	Study of respiratory structures: a. Gills of Bony fish and Cartilaginous fish. b. Lungs of Frog c. Lungs of Mammal. d. Accessory respiratory structure in Anabas (Labyrinthine organ) e. Air sacs of Pigeon.
8	Study of locomotory organs (<i>Amoeba</i> , <i>Unio</i> , Cockroach, Starfish, Fish, and Birds)
9	Study of hearts (Cockroach, Shark, Frog, Calotes, Crocodile, Mammal)
10	Study of permanent slides on topic of Reproduction a. Sponge gemmules b. Hydra budding c. T.S. of mammalian testis d. T.S. of mammalian ovary



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Semester III - Nutrition and Excretion , Respiration and circulation, Control and coordination of Life Processes, Locomotion and Reproduction - SZO302 (Paper II: Course 6) (Internal Assessment Pattern)	
Duration:	Marks: 40
1. Class Test (Based on theory unit 1,2,3)	20 Marks
2. Assignment	15 Marks
3. Class participation and overall conduct	05 Marks

Semester III - Nutrition and Excretion , Respiration and circulation, Control and coordination of Life Processes, Locomotion and Reproduction - SZO302 (Paper II: Course 6) (Internal Class Test Paper Pattern)		
Duration:	Marks: 20	
Q.1. a) Fill in the blanks (1 or 2 questions each from unit1,2,3)	05 Marks	
b) Match the column (1 or 2 questions each from unit1,2,3)	05 Marks	
Column A		Column B
1.		a)
2.		b)
3.		c)
4.	d)	
5.	e)	
Write short note on (Any two)	10 Marks	
1.		Unit1
2.		Unit2
3.		Unit3

Semester III - Nutrition and Excretion , Respiration and circulation, Control and coordination of Life Processes, Locomotion and Reproduction - SZO302 (Paper II: Course 6) (Theory Paper Pattern)		
Duration: 2 hrs	Marks: 60	
Q.1. a) Fill in the Blanks: (2-3 questions from each Unit)	04 Marks	
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
b) Match the column: (2-3 questions from each Unit)	04 Marks	
Column A		Column B
1.		a)
2.		b)
3.	c)	



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

4. d) 5. e) 6. f) 7. g) 8. h)	
Q.1. c) Define: Answer in one sentence: (One/Two from each Unit) 1. 2. 3. 4.	04 Marks
Unit1 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Unit2 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Q.4. Unit 3 a) Answer the following: (12 marks each) OR a) Answer in brief: (6Marks) b) Answer in brief: (6Marks)	12 Marks
Q.5. Write Short notes on: (Any four) 2 questions from each Unit a) b) c) d) e) f)	12 Marks

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Semester III - Nutrition and Excretion , Respiration and circulation, Control and coordination of Life Processes, Locomotion and Reproduction - SZOP302 (Paper II: Course 6) (Practical Paper Pattern)	
Duration: 5 hrs	Marks: 50
Major Question Q1. Urine analysis—Normal and abnormal constituents	15 Marks
Minor Question Q2. Detection of ammonia in water excreted by fish OR Q2. Detection of uric acid from excreta of Birds OR Q2. Demonstration of food and feeding mechanism in <i>Paramecium</i>	10 Marks
Q3. Identification a. Nutritional apparatus b. Respiratory structures c. Locomotory organs d. Study of hearts e. Permanent slides on reproduction	15 Marks
Q4. Viva	05 Marks
Q5. Journal	05 Marks

Course Outcome	
After the completion of the course, students will able to	
CO1	understand the increasing complexity of nutritional, excretory and osmoregulatory physiology in evolutionary hierarchy.
CO2	correlate the habit and habitat with nutritional, excretory and osmoregulatory structures
CO3	correlate the habit and habitat with respiratory and circulatory structures.
CO4	understand the process of control and coordination by nervous and endocrine regulation.
CO5	be acquainted with various reproductive strategies present in animals.

Recommended Resources	
<ol style="list-style-type: none"> 1. Vertebrate Zoology Volume I- Jordan and Verma, S. Chand and Co. 2. Invertebrate Zoology Volume II- Jordan and Verma, S. Chand and Co. 3. Invertebrate Zoology- Majumuria T. C., Nagin S. and Co. 4. Chordate Zoology- Dhama P. S. and Dhama J. K., R. Chand and Co. 5. Invertebrate Zoology- Dhama P. S. and Dhama J. K., R. Chand and Co. 6. Introduction to Vertebrates- Moore Cambridge University- Low Priced Edition. 7. Zoology- Miller S. A. and Harley J. B., Tata Mc Graw Hill. 8. Modern Textbook of Zoology, Invertebrates, Kotpal R.L 9. Biological Science, Taylor D.J., Stout G.W., Green N.P.O, Soper R. Cambridge University Press. 	

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Programme:S.Y.B.Sc.

Semester:III

Course: Zoology- III(Course7)

Course code: SZO303

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
6	-	1	3	20	15	05		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite

1. Basic knowledge about Zoology
2. Curiosity regarding aspects of the animal kingdom

Course Objectives

1. To equip learners with a sound knowledge of how animals interact with one another and their environment.
2. To enable the learners to understand different behavioural patterns
3. To acquaint learners with the concepts of parasitism, their relationship with environment.
4. To disseminate information on economic aspects of zoology like apiculture, vermiculture, dairy science.
5. To encourage young learners for self-employment and career development.

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

SEMESTER III
Course Content

Unit No.	Module No.	Content	Lectures
		SZO303 (Paper III Course 7): Ethology, Parasitology, Economic Zoology	
1	I,II,III	<p>Ethology</p> <p>I. Introduction to Ethology Definition, History and Scope of Ethology, Animal behaviour - Innate and Learned behaviour, Types of learning-Habituation, Imprinting and types of imprinting -filial and sexual, Classical conditioning, Instrumental learning and insight learning.</p> <p>II. Aspects of animal behaviour Communication in Bees and Ants, Mimicry and colouration, Role of hormones and pheromones in sexual behaviour, Displacement activities, Ritualization, Migration in fish, schooling behaviour, Habitat selection, territorial behaviour, food selection and foraging, behaviour in African ungulates</p> <p>III. Social behaviour Social behaviour in primates-Hanuman langur, Elements of Socio-biology: Selfishness, cooperation, altruism, kinship and inclusive fitness</p>	15
2	I,II,III, IV,V	<p>Parasitology</p> <p>I. Introduction to Parasitology and types of parasites Definitions: parasitism, host, parasite, vector-biological and mechanical, Types of parasites- Ectoparasites, Endoparasite and their subtypes, Parasitic adaptations in Ectoparasites and Endoparasites, Types of hosts: intermediate and definitive, reservoir</p> <p>II. Host-parasite relationship-Host specificity Definition, structural specificity, physiological specificity and ecological specificity.</p> <p>III. Life cycle, pathogenicity, control measures and treatment <i>Entamoeba histolytica, Fasciola hepatica, Taenia solium, Wuchereria bancrofti</i></p> <p>IV. Morphology, life cycle, pathogenicity, control measures and treatment Head louse (<i>Pediculus humanus capitis</i>), Mite (<i>Sarcoptes scabiei</i>), Bed bug (<i>Cimex lectularis</i>)</p> <p>V. Parasitological significance Zoonosis- Bird flu, Anthrax, Rabies and Toxoplasmosis</p>	15

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

3	I,II,III	<p>Economic Zoology</p> <p>I. Apiculture Methods of bee keeping and management- An introduction to different species of honey bees used in apiculture, Selection of flora and bees for apiculture, Advantages and disadvantages of traditional and modern methods of apiculture, Pests and Bee enemies - Wax moth, wasp, black ants, bee- eaters, king crow and disease control. Economic importance - Honey- Production, Chemical composition and economic importance, Bees wax- Economic importance, Role of honey bees in pollination.</p> <p>II. Vermiculture Rearing methods, management and economic importance - An introduction to different species of earthworms used in vermiculture, Methods of vermiculture, Maintenance and harvesting, Economic importance: advantages of vermiculture, demands for worms; market for vermin-compost and entrepreneurship.</p> <p>III. Dairy Science Dairy development in India - Role of dairy development in rural economy, employment opportunities, Dairy Processing, Filtration, cooling, chilling, clarification, pasteurization, freezing, Milk and milk products, Composition of milk, Types of milk: a) Buffalo milk and b) Cow milk (a1 and a2) whole milk and toned milk, Milk products</p>	15
		Total No. of Lectures	45

Beyond the syllabus

Tutorial activities: Student's presentations, Use of E-learning and M-learning, Use of animations.

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

SZOP303 (SEMESTER III)
Based on Paper III-Course 7

List of experiments	
Sr. No.	Description
1	Extraction of Casein from Milk and its qualitative estimation
2	Preparation of paneer from given milk sample
3	Measurement of density of milk using different samples by Lactometer
4	Study of Honey Bee : a. Life Cycle of Honey Bee and Bee Hive b. Mounting of Mouthparts of Honey Bee c. Mounting of Legs of Honey Bee d. Mounting of Sting Apparatus of Honey Bee
5	Study of ethological aspects: a. Warning Colouration b. Instincts c. Imprinting d. Communication in animals: Chemical signals and sound signals e. Displacement activities in animals: Courtship and mating behavior in animals and ritualization
6	Study of Protozoan parasites: a. <i>Trypanosoma gambiense</i> b. <i>Giardia intestinalis</i>
7	Study of Helminth parasites: a. <i>Ancylostoma duodenale</i> b. <i>Dracunculus medinensis</i>
8	Parasitic adaptations: Scolex and mature proglottid of Tapeworm
9	Study of Ectoparasites: a. Leech b. Tick c. Mite
10	Project- Suggested topics on economic zoology (e.g. Apiculture, sericulture/ lac culture / vermicompost Technique / Construction of artificial beehives/Animal husbandry/ aquaculture, etc.)

Semester III - Ethology, Parasitology, Economic Zoology
- SZO303 (Paper III: Course 7) (Internal Assessment Pattern)

Duration:	Marks: 40
1. Class Test (Based on theory unit 1,2,3)	20 Marks
2. Assignment	15 Marks
3. Class participation and overall conduct	05 Marks



**The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)**

Semester III - Ethology, Parasitology, Economic Zoology - SZO303 (Paper III: Course 7) (Internal Class Test Paper Pattern)																			
Duration:		Marks: 20																	
Q.1. a) Fill in the blanks (1 or 2 questions each from unit1,2,3)		05 Marks																	
b) Match the column (1 or 2 questions each from unit1,2,3)		05 Marks																	
<table border="0"> <tr> <td style="text-align: right;">Column A</td> <td style="width: 100px;"></td> <td style="text-align: left;">Column B</td> </tr> <tr> <td style="text-align: right;">1.</td> <td></td> <td style="text-align: left;">a)</td> </tr> <tr> <td style="text-align: right;">2.</td> <td></td> <td style="text-align: left;">b)</td> </tr> <tr> <td style="text-align: right;">3.</td> <td></td> <td style="text-align: left;">c)</td> </tr> <tr> <td style="text-align: right;">4.</td> <td></td> <td style="text-align: left;">d)</td> </tr> <tr> <td style="text-align: right;">5.</td> <td></td> <td style="text-align: left;">e)</td> </tr> </table>	Column A			Column B	1.		a)	2.		b)	3.		c)	4.		d)	5.		e)
Column A		Column B																	
1.		a)																	
2.		b)																	
3.		c)																	
4.		d)																	
5.		e)																	
Write short note on (Any two)		10 Marks																	
<table border="0"> <tr> <td style="text-align: right;">1.</td> <td style="width: 100px;"></td> <td style="text-align: left;">Unit1</td> </tr> <tr> <td style="text-align: right;">2.</td> <td></td> <td style="text-align: left;">Unit2</td> </tr> <tr> <td style="text-align: right;">3.</td> <td></td> <td style="text-align: left;">Unit3</td> </tr> </table>	1.			Unit1	2.		Unit2	3.		Unit3									
1.		Unit1																	
2.		Unit2																	
3.		Unit3																	

Semester III - Ethology , Parasitology, Economic Zoology - SZO303 (Paper III: Course 7) (Theory Paper Pattern)																												
Duration: 2 hrs		Marks: 60																										
Q.1. a) Fill in the Blanks: (2-3 questions from each Unit)		04 Marks																										
<table border="0"> <tr> <td style="text-align: right;">1.</td> <td></td> <td></td> </tr> <tr> <td style="text-align: right;">2.</td> <td></td> <td></td> </tr> <tr> <td style="text-align: right;">3.</td> <td></td> <td></td> </tr> <tr> <td style="text-align: right;">4.</td> <td></td> <td></td> </tr> <tr> <td style="text-align: right;">5.</td> <td></td> <td></td> </tr> <tr> <td style="text-align: right;">6.</td> <td></td> <td></td> </tr> <tr> <td style="text-align: right;">7.</td> <td></td> <td></td> </tr> <tr> <td style="text-align: right;">8.</td> <td></td> <td></td> </tr> </table>	1.				2.			3.			4.			5.			6.			7.			8.					
1.																												
2.																												
3.																												
4.																												
5.																												
6.																												
7.																												
8.																												
b) Match the column: (2-3 questions from each Unit)		04 Marks																										
<table border="0"> <tr> <td style="text-align: right;">Column A</td> <td style="width: 100px;"></td> <td style="text-align: left;">Column B</td> </tr> <tr> <td style="text-align: right;">1.</td> <td></td> <td style="text-align: left;">a)</td> </tr> <tr> <td style="text-align: right;">2.</td> <td></td> <td style="text-align: left;">b)</td> </tr> <tr> <td style="text-align: right;">3.</td> <td></td> <td style="text-align: left;">c)</td> </tr> <tr> <td style="text-align: right;">4.</td> <td></td> <td style="text-align: left;">d)</td> </tr> <tr> <td style="text-align: right;">5.</td> <td></td> <td style="text-align: left;">e)</td> </tr> <tr> <td style="text-align: right;">6.</td> <td></td> <td style="text-align: left;">f)</td> </tr> <tr> <td style="text-align: right;">7.</td> <td></td> <td style="text-align: left;">g)</td> </tr> <tr> <td style="text-align: right;">8.</td> <td></td> <td style="text-align: left;">h)</td> </tr> </table>	Column A			Column B	1.		a)	2.		b)	3.		c)	4.		d)	5.		e)	6.		f)	7.		g)	8.		h)
Column A		Column B																										
1.		a)																										
2.		b)																										
3.		c)																										
4.		d)																										
5.		e)																										
6.		f)																										
7.		g)																										
8.		h)																										
Q.1. c) Define: Answer in one sentence: (One/Two from each Unit)		04 Marks																										
<table border="0"> <tr> <td style="text-align: right;">1.</td> <td></td> </tr> <tr> <td style="text-align: right;">2.</td> <td></td> </tr> <tr> <td style="text-align: right;">3.</td> <td></td> </tr> <tr> <td style="text-align: right;">4.</td> <td></td> </tr> </table>	1.			2.		3.		4.																				
1.																												
2.																												
3.																												
4.																												



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Unit1 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Unit2 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Q.4. Unit 3 a) Answer the following: (12 marks each) OR a) Answer in brief: (6Marks) b) Answer in brief: (6Marks)	12 Marks
Q.5. Write Short notes on: (Any four) 2 questions from each Unit a) b) c) d) e) f)	12 Marks

Semester III - Ethology , Parasitology, Economic Zoology
- SZOP303 (Paper III: Course 7) (Practical Paper Pattern)

Duration: 5 hrs	Marks: 50
Major Question Q1. Extraction of Casein from Milk and its qualitative estimation OR Q1. Preparation of paneer from the given milk sample. OR Q1. Measurement of density of milk using different samples by lactometer	12 Marks

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Minor Question	
Q2. Life Cycle of Honey Bee and Bee Hive OR Q2. Mounting of Mouthparts of Honey Bee OR Q2. Mounting of Legs of Honey Bee OR Q2. Mounting of Sting Apparatus of Honey Bee	08 Marks
Q3. Identify and describe as per instructions: a. Ethology b. Protozoan parasites c. Helminth parasites d. Ectoparasites e. Parasitic adaptations	15 Marks
Q4. Project submission and Viva based on project	10 Marks
Q5. Viva and Journal	05 Marks

Course Outcome

After the completion of the course, students will able to

CO1 understand different types of animal behaviour and their role in biological adaptations.

CO2 understand the general epidemiological aspects of parasites that affect humans and apply simple preventive measures for the same.

CO3 know the use of animals to mankind and the means to make the most of it.

CO4 pursue entrepreneurship as career

CO5 learn the modern techniques in animal husbandry.

Recommended Resources

1. Animal Behaviour- David McFarland
2. Animal Behaviour- Mohan Arora
3. Animal Behaviour- Reena Mathur
4. An introduction to Animal Behaviour-Dawkins
5. Animal Behaviour-Agarwal
6. Animal Behaviour-Tinbergen
7. Biology of Insects- 1992 Saxena S. C. Oxford and IBH Publishing Co New Delhi.Bombay. Calcutta
8. A Text Book of Entomology- 1974Mathur V. K. and Upadhayay K Goel Printing press, Barani.
9. Bee and Bee Keeping- Roger A. Morse, Conell University PressLondon
10. Vermiculture Technology - Clive A. Edwards, Norman Q. Arancon and Rhonda Sherman
11. Parasitology- Chatterjee K.D., Chatterjee Medical Publishers.
12. Medical Parasitology-Arora
13. Textbook of Medical Parasitology-.C.K Jayaram Paniker, Jaypee Brothers.



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

14. A text book of Parasitology- Kochhar S.K. Dominant Pub. & Dis, New Delhi.
15. Essentials of Parasitology- Gerald and Schmidt: Universal Bookstall, New Delhi.
16. Parasitology- Sharma P.N. and RatnuL.N., Chand S &Co. Pvt. Ltd.
17. Introduction to Parasitology- Chandler and Read John Wiley & Sons
18. Economic Zoology- Biostatistics and Animal behaviour – S. Mathur, Rastogi Publications.
19. Economic Zoology- Shukla G.S. & Upadhyay V.B., Rastogi Publications.
20. A handbook on Economic Zoology, S.Chand &Co.

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Programme:S.Y.B.Sc.

Semester:IV

Course: Zoology- I(Course8)

Course code: SZO401

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
6	-	1	3	20	15	05		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite 1. Basic knowledge about Zoology
 2. Curiosity regarding aspects of the animal kingdom

Course Objectives

1. To impart scientific knowledge about how life originated and evolved on our planet.
2. To develop knowledge and understanding of genetic variability within a population and how the change in the gene pool leads to evolution of species
3. To inculcate scientific temperament in the learner and research-oriented skills in students.

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

SEMESTER IV
Course Content

Unit No.	Module No.	Content	Lectures
		SZO401 (Paper I Course 8): Origin and Evolution of Life, Population Genetics and Evolution , Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research	
1	I,II,III	Origin and Evolution of Life I. Introduction Origin of Universe, Chemical evolution - Miller-Urey experiment, Haldane and Oparin theory, Origin of Life, Origin of Eukaryotic cell II. Evidences in favour of Organic evolution Evidences from: Geographical distribution, Palaeontology, Anatomy, Embryology, Physiology and Genetics III. Theories of organic evolution Theory of Lamarck, Theory of Darwin and Neo Darwinism, Mutation Theory, Modern Synthetic theory, Weismann's Germplasm theory, Neutral theory of Molecular evolution	15
2	I,II,III	Population Genetics and Evolution I. Introduction to Population genetics Definition, Brief explanation of the following terms: Population, Gene pool, Allele frequency, Genotype frequency, Phenotype frequency, Microevolution II. Population genetics Hardy- Weinberg Law, Factors that disrupt Hardy Weinberg equilibrium: Mutation, Migration (Gene flow), Non-random mating (Inbreeding, inbreeding depression, Assortative mating-Positive and Negative, Dis-assortative mating),Genetic drift (Sampling error, Fixation, Bottleneck effect and Founder effect), Natural Selection, Patterns of Natural Selection, Stabilizing selection, Directional selection (Examples: Peppered moth, Antibiotic resistance in bacteria, Pesticide resistance), Disruptive selection III. Evolutionary genetics Genetic variation: Genetic basis of Variation-Mutations and Recombination (crossing over during meiosis, independent assortment of chromosomes during meiosis and random union of gametes during fertilization), Nature of genetic variations: Genetic polymorphism, Balanced polymorphism, Mechanisms that preserve balanced Polymorphism- Heterozygote advantage and frequency dependent selection, Neutral variations, Geographic variation (Cline), Species Concept: Biological species concept and	15

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

		<p>evolutionary species concept, Speciation and Isolating mechanisms: Definition and Modes of speciation (Allopatric, Sympatric, Parapatric and Peripatric), Geographical isolation, Reproductive isolation and its isolating mechanisms (Prezygotic and Postzygotic), Macroevolution and Megaevolution: Concept and Patterns of macroevolution (Stasis, Preadaptation /Exaptation, Mass extinctions, Adaptive radiation and Coevolution), Megaevolution.</p>	
3	I,II,III, IV,V	<p>Scientific Attitude Methodology, Scientific Writing and Ethics in Scientific Research</p> <p>I. Process of science: A dynamic approach to investigation- The Scientific method, Deductive reasoning and inductive reasoning, Critical thinking, Role of chance in scientific discovery, Scientific Research: Definition, Difference between method and methodology, Characteristics, Types, Steps in the Scientific Method: Identification of research problem, Formulation of research hypothesis, Testing the hypothesis using experiments or surveys, Preparing research/study design including methodology and execution (Appropriate controls, sample size, technically sound, free from bias, repeat experiments for consistency), Documentation of data, Data analysis and interpretation, Results and Conclusions, Dissemination of data: Reporting results to scientific community (Publication in peer-reviewed journals, thesis, dissertation, reports, oral presentation, poster presentation), Application of knowledge: Basic research, Applied research, Translational research, Patent: process of patent filing, WIPO, IPR.</p> <p>II. Scientific writing: Structure and components of a research paper:(Preparation of manuscript for publication of research paper- Title, Authors and their affiliations, Abstract, Keywords and Abbreviations, Introduction, Material and Methods, Results, Discussion, Conclusions, Acknowledgement, Bibliography; Figures, Tables and their legends</p> <p>III. Writing a review paper Structure and components of research report: Report writing, Types of report, Computer application: Plotting of graphs, Statistical analysis of data. Internet and its application in Research-Literature survey, Online submission of manuscript for publication</p> <p>IV. Ethics Ethics in animal research: The ethical and sensitive care and use of animals in research, teaching and testing, Approval from Institutional animal ethics Committee, Ethics in clinical research: Approval from Clinical Research Ethics Committee</p>	15

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

		Informed consent, Approval from concerned/ appropriate authorities: National Biodiversity Authority, State Biodiversity Board, Forest Department, Conflict of interest V. Plagiarism	
		Total No. of Lectures	45

Beyond the syllabus

Tutorial activities: Student's presentations, Use of E-learning and M-learning, Use of animations.

SZOP401 (SEMESTER IV)
Based on Paper I-Course 8

List of experiments

Sr. No.	Description
1	Study of population density by Line transect method & Quadrant method and calculate different diversity indices. a. Index of Dominance b. Index of frequency c. Rarity Index d. Shannon Index e. Index of species diversity
2	Study of Prokaryotic cells (bacteria) by Crystal violet staining technique
3	Study of Eukaryotic cells (WBCs) from blood smear by Leishman's stain
4	Identification and study of fossils a. Arthropods: Trilobite b. Mollusca: Ammonite c. Aves: Archaeopteryx
5	Identification of a. Allopatric speciation (Cyprinodont species) b. Sympatric speciation (Hawthorn fly and Apple maggotfly) c. Parapatric speciation (Snail)
6	Bibliography/ Abstract writing
7	Preparation of Power Point Presentation

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Semester IV - Origin and Evolution of Life, Population Genetics and Evolution , Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research - SZO401 (Paper I: Course 8) (Internal Assessment Pattern)	
Duration:	Marks: 40
1. Class Test (Based on theory unit 1,2,3)	20 Marks
2. Assignment	15 Marks
3. Class participation and overall conduct	05 Marks

Semester IV - Origin and Evolution of Life, Population Genetics and Evolution , Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research - SZO401 (Paper I: Course 8) (Internal Class Test Paper Pattern)		
Duration:	Marks: 20	
Q.1. a) Fill in the blanks (1 or 2 questions each from unit1,2,3)	05 Marks	
b) Match the column (1 or 2 questions each from unit1,2,3)	05 Marks	
Column A		Column B
1.		a)
2.		b)
3.		c)
4.	d)	
5.	e)	
Write short note on (Any two)	10 Marks	
1.		Unit1
2.		Unit2
3.		Unit3

Semester IV - Origin and Evolution of Life, Population Genetics and Evolution , Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research - SZO401 (Paper I: Course 8) (Theory Paper Pattern)		
Duration: 2 hrs	Marks: 60	
Q.1. a) Fill in the Blanks: (2-3 questions from each Unit)	04 Marks	
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
b) Match the column: (2-3 questions from each Unit)	04 Marks	
Column A		Column B
1.		a)
2.		b)
3.		c)
4.	d)	



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

5. e) 6. f) 7. g) 8. h)	
Q.1. c) Define: Answer in one sentence: (One/Two from each Unit) 1. 2. 3. 4.	04 Marks
Unit1 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Unit2 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Q.4. Unit 3 a) Answer the following: (12 marks each) OR a) Answer in brief: (6Marks) b) Answer in brief: (6Marks)	12 Marks
Q.5. Write Short notes on: (Any four) 2 questions from each Unit a) b) c) d) e) f)	12 Marks

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Semester IV- Origin and Evolution of Life, Population Genetics and Evolution , Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research - SZOP401 (Paper I: Course 8) (Practical Paper Pattern)	
Duration: 5 hrs	Marks: 50
Major Question Q1. Study Population density by Line transect or Quadrant method and calculate biodiversity indices (any 2)	12 Marks
Minor Question Q2. Prepare a smear to show prokaryotic cell. OR Q2. Prepare a smear to show eukaryotic cell.	08 Marks
Q3. Identify and describe as per instructions: a. Fossils b. Speciation	08 Marks
Q4. From the given article, prepare the bibliography/ abstract	06 Marks
Q5. Power point presentation	06 Marks
Q6. Viva and Journal	10 Marks

Course Outcome	
After the completion of the course, students will able to	
CO1	ponder and critically view the different theories of evolution.
CO2	understand the forces that cause evolutionary changes in natural populations
CO3	think scientifically and will understand the ethical aspects of research

Recommended Resources	
<ol style="list-style-type: none"> 1. Developmental Biology- 5thEdition, Scot F. Gilbert, Sinauer Associates Inc. 2. Developmental Biology- Subramoniam T., Narosa Publishers. 3. Developmental Biology- Berril N.J., Tata Mc Graw –Hill Publication. 4. Essential Reproduction-Martin H. Johnson, Wiley-Blackwell Publication. 5. Chick Embryology- Bradley M. Pattern. 6. Embryology- Mohan P. Arora. 7. Chordate Embryology- Dalela, Verma and Tyagi 8. Human Anatomy and Physiology. E. L. Marieb, Pearson Education Low Price Edition 9. Biological Science. Taylor, Green and Stout. Cambridge Publication 10. Biology. E. P. Solomon, L. R. Berg, D. W. Martin, Thompson Brooks/Cole 11. Human Biology-Daniel D Chiras Jones and Bartlett 12. The Physiology of Reproduction Vol I&II - E.K .Nobil and JU. D.Neil, Raven Press, New York 13. Biology -The Unity and Diversity of Life. C. Starr, R. Taggart, C. Evers, L. Starr, Brooks/Cole Cengage learning International Edition 14. Research Methodology, Methods and Techniques- by C.R. Kothari, Wiley Eastern Ltd. Mumbai 15. Practical research planning and design 2ndedition- Paul D Leedy, Macmilan Publication 	

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Programme:S.Y.B.Sc.

Semester:IV

Course: Zoology- II(Course9)

Course code: SZO402

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
6	-	1	3	20	15	05		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite 1. Basic knowledge about Zoology
 2. Curiosity regarding aspects of the animal kingdom

Course Objectives

1. To study the structural and functional organization of cell with an emphasis on nucleus, plasma membrane and cytoskeleton.
2. To acquaint the learner with ultrastructure of cell organelles and their functions
3. To give learner insight into the structure of biomolecules, and their role in sustenance of life



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

SEMESTER IV
Course Content

Unit No.	Module No.	Content	Lectures
		SZO402 (Paper II Course 9): Cell Biology, Endo membrane System and Biomolecules	
1	I,II,III, IV,V	<p>Cell Biology</p> <p>I. Introduction to cell biology Definition and scope, Cell theory, Generalized prokaryotic, eukaryotic cell: size, shape and structure</p> <p>II. Nucleus Size, shape, number and position, Structure and functions of interphase nucleus, Ultrastructure of nuclear membrane and pore complex, Nucleolus: general organization, chemical composition & functions, Nuclear sap/ nuclear matrix, Nucleocytoplasmic interactions</p> <p>III. Plasma membrane</p> <ol style="list-style-type: none"> a. Fluid Mosaic Model b. Junctional complexes c. Membrane receptors d. Modifications: Microvilli and Desmosomes <p>IV. Transport across membrane</p> <ol style="list-style-type: none"> a. Diffusion and Osmosis b. Transport: Passive and Active c. Endocytosis and Exocytosis <p>V. Cytoskeletal structures Microtubules: Composition and functions, Microfilaments: Composition and Functions</p>	15
2	I,II,III, IV	<p>Endomembrane System</p> <p>I. Endoplasmic reticulum: General morphology of endomembrane system, Morphology and Types of ER, Biogenesis of ER, Functions of RER and SER</p> <p>II. Golgi complex: Morphology of Golgi complex, Cytochemistry, Functions of Golgi complex Protein Glycosylation, Lipid and Polysaccharide Metabolism, Protein Sorting and Secretion, Golgi anti-apoptotic protein (GAAP)</p> <p>III. Lysosomes: Origin, occurrence and polymorphism, Functions of lysosomes: Peroxisomes: Origin, morphology & functions</p> <p>IV. Mitochondria: Morphology and chemical composition of mitochondria, Bioenergetics, Chemical energy & ATP Glycolysis Krebs cycle, Respiratory chain and Oxidative phosphorylation</p>	15



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

3	I,II,III, IV,V	<p>Biomolecules</p> <p>I. Biomolecules: Concept of Micromolecules and Macromolecules</p> <p>II. Carbohydrates: Definition Classification, Properties and Isomerism, Glycosidic bond Structure of – a. Monosaccharides- Glucose and Fructose, b. Oligo-saccharides - Lactose and Sucrose, c. Polysaccharides Cellulose, Starch, Glycogen and Chitin Biological role and their Clinical significance</p> <p>III. Amino Acids and Proteins: Basic structure of amino acid, classification of amino acids, Essential and Non-essential amino acids, Peptide bond, Protein conformation: Primary, Secondary, Tertiary, Quaternary Types of proteins – Structural (Collagen) and functional proteins (Hemoglobin) role and their Clinical significance</p> <p>IV. Lipids: Definition, classification of lipids with examples, Ester linkage Physical and Chemical properties of lipids, Saturated and Unsaturated fatty acids, Essential fatty acids Triacylglycerols, Phospholipids (Lecithin and Cephalin) and Steroids (Cholesterol), Biological role and their Clinical significance</p> <p>V. Vitamins: Water soluble vitamins (e.g. Vit C, Vit B12), Lipid soluble, vitamins (e.g. Vit A, Vit D), Biological role and their Clinical significance</p>	15
Total No. of Lectures			45

Beyond the syllabus

Tutorial activities: Student's presentations, Use of E-learning and M-learning, Use of animations.

SZOP402 (SEMESTER IV)
Based on Paper II-Course 9

List of experiments

Sr. No.	Description
1	Study of permeability of cell through plasma membrane (Osmosis in blood cells)
2	Measurement of cell diameter by oculometer (by using permanent slide)
3	Qualitative tests for carbohydrates (Molisch's test, Benedict's test, Barfoed's test, Anthrone test)
4	Qualitative tests for protein (Ninhydrin test, Biuret test, Millon's test, Xanthoproteic test)
5	Qualitative test for lipids (Solubility test, Sudan III test)



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

6	Study of rancidity of lipids by titrimetric method
7	Ultra structure of cell organelles (Electron micrographs) a. Nucleus b. Endoplasmic reticulum (Smooth and Rough) c. Mitochondria. d. Golgi apparatus e. Lysosomes
8	Study of clinical disorders due to carbohydrates, proteins and lipid imbalance (Photograph to be provided / significance to given and disorder to be identified) a. Hyperglycemia, Hypoglycemia. b. Thalassemia, Kwashiorkar c. Obesity, Atherosclerosis

Semester IV - Cell Biology, Endo membrane System and Biomolecules
- SZO402 (Paper II: Course 9) (Internal Assessment Pattern)

Duration:	Marks: 40
1. Class Test (Based on theory unit 1,2,3)	20 Marks
2. Assignment	15 Marks
3. Class participation and overall conduct	05 Marks

Semester IV - Cell Biology, Endo membrane System and Biomolecules
- SZO402 (Paper II: Course 9) (Internal Class Test Paper Pattern)

Duration:	Marks: 20
Q.1. a) Fill in the blanks (1 or 2 questions each from unit1,2,3)	05 Marks
b) Match the column (1 or 2 questions each from unit1,2,3) Column A 1. 2. 3. 4. 5. Column B a) b) c) d) e)	05 Marks
Write short note on (Any two) 1. Unit 1 2. Unit 2 3. Unit3	10 Marks

Semester IV - Cell Biology, Endo membrane System and Biomolecules
- SZO402 (Paper II: Course 9) (Theory Paper Pattern)

Duration: 2 hrs	Marks: 60
Q.1. a) Fill in the Blanks: (2-3 questions from each Unit) 1. 2. 3. 4. 5. 6. 7. 8.	04 Marks
b) Match the column: (2-3 questions from each Unit) Column A 1. 2. Column B a) b)	04 Marks



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

3. c) 4. d) 5. e) 6. f) 7. g) 8. h)	
Q.1. c) Define: Answer in one sentence: (One/Two from each Unit) 1. 2. 3. 4.	04 Marks
Unit1 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Unit2 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Q.4. Unit 3 a) Answer the following: (12 marks each) OR a) Answer in brief: (6Marks) b) Answer in brief: (6Marks)	12 Marks
Q.5. Write Short notes on: (Any four) 2 questions from each Unit a) b) c) d) e) f)	12 Marks

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Semester IV - Cell Biology, Endo membrane System and Biomolecules - SZOP402 (Paper II: Course 9) (Practical Paper Pattern)	
Duration: 5 hrs	Marks: 50
Major Question Q1. Study of permeability of cell through plasma membrane (Osmosis in blood cells). <p style="text-align: center;">OR</p> Q1. Measurement of cell diameter by oculometer (by using permanent slide)	15 Marks
Minor Question Q2. Qualitative tests for carbohydrates (Molisch's test, Benedict's test, Barfoed's test, Anthrone test) <p style="text-align: center;">OR</p> Q2. Qualitative tests for proteins (Ninhydrin test, Biuret test, Millon's test, Xanthoproteic test) <p style="text-align: center;">OR</p> Q2. Qualitative test for lipids (Solubility test, Sudan III test) <p style="text-align: center;">OR</p> Q2. Study of rancidity of lipids by titrimetric method	10 Marks
Q3. Identify and describe as per instructions: 1. Ultra structure of cell organelles (a, b &c) 2. Clinical disorders (d &e)	15 Marks
Q4.Viva	05 Marks
Q5.Journal	05 Marks

Course Outcome

After the completion of the course, students will able to

CO1 understand the transport mechanisms for the maintenance and composition of cell

CO2 understand the interlinking of endomembrane system for functioning of cell

CO3 realize the importance of biomolecules and their clinical significance

Recommended Resources

1. Cell Biology. Singh and Tomar, Rastogi Publication
2. Cell and Molecular Biology E.D.P De Robertis and E.M.R Robertis, CBS Publishers and Distributors.
3. The cell-A molecular Approach Geoffrey M.Coper ASM Press Washington D.C.
4. A textbook of cytology Suruchi Tyagi Dominant Publishers and Distributors New Delhi.
5. Cell and molecular biology Gupta P.K, Rastogi Publication, India.
6. Cell Biology Pawar C.B. Himalaya publication
7. Molecular Biology of the cell (6thed) by the Insetus
8. Campbell Biology (9thEd.)



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

9. Principles of Biochemistry, 2005, 2nd and 3rd edn. Lehninger A.L. Nelson D.L. and Cox M.M,
10. Biochemistry, Dushyant Kumar Sharma, 2010, Narosa Publishing house PVT. Ltd.
11. Fundamentals of Biochemistry, Dr AC Deb, 1983, New Central Book Agency Ltd.
12. A Textbook of Biochemistry, 9thedition, Dr. Rama Rao A.V.S.S and Dr A Suryalakshmi.
13. Biochemistry-G Zubay , Addison Wesley, 1983
14. Biochemistry, L Stryer, 3rd/4th/5th ed, 1989, Freeman and Co. NY
15. Harper's Biochemistry, 1996, 26thedition, Murray R.K. Granner D.K. Mayes P.A. Rodwell V.M. Hall international USA
16. Outline of Biochemistry, 1976, E.E. Conn and P.K. Stumpf. John Wiley and Sons US



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Programme:S.Y.B.Sc.

Semester:IV

Course: Zoology- III(Course10)

Course code: SZO403

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
6	-	1	3	20	15	05		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite 1. Basic knowledge about Zoology
 2. Curiosity regarding aspects of the animal kingdom

Course Objectives

1. To acquaint the learners with key concepts of embryology.
2. To acquaint the learners with different aspects of human reproduction.
3. To make them aware of the causes of infertility, techniques to overcome infertility and the concept of birth control.
4. To acquaint the learners with factors affecting the environment and its conservation strategies.



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

SEMESTER IV
Course Content

Unit No.	Module No.	Content	Lectures
		<u>SZO403</u> (Paper III Course 10): Comparative Embryology, Aspects of Human Reproduction, Pollution and its effect on organisms	
1	I,II,III, IV,V,VI, VII, VIII,IX	Comparative embryology I. Types of Eggs- Based on amount and distribution of yolk II. Structure and Types of Sperms III. Types and Patterns of Cleavages IV. Types of Blastulae V. Gastrulation, Morphogenetic movements VI. Coelom -Formation and types VII. Placentation and Types of Placentae -Based on histology, Morphology and implantation VIII. Extra-embryonic Membranes in Chick IX. Fate Mapping Techniques	15
2	I,II,III, IV	Aspects of Human Reproduction I. Human Reproductive system and Hormonal regulation Anatomy of human male and female reproductive system, Hormonal regulation of Reproduction and Impact of age on reproduction-Menopause and Andropause II. Contraception & birth control Difference between contraception and birth control, Natural Methods: Abstinence, Rhythm method, Temperature method, cervical mucus or Billings method, Coitus interruptus, Lactation amenorrhea, Artificial methods : Barrier methods, Hormonal methods, Intrauterine contraceptives, Sterilization, Termination, Abortion III. Infertility Female infertility - Causes - Failure to ovulate; production of infertile eggs; damage to oviducts (oviduct scarring and PID or Pelvic inflammatory disease, TB of oviduct), Uterus (T. B. of uterus and cervix). Infertility associated disorder- (Endometriosis, Polycystic Ovarian syndrome (PCOS), POF (Primary ovarian failure) STDs (Gonorrhoea, Chlamydia, Syphilis and Genital Herpes); Antibodies to sperm; Genetic causes-Recurrent abortions; Role of endocrine disruptors. Male infertility - Causes :Testicular failure, infections of epididymis, seminal vesicles or prostate, hypogonadism, cryptorchidism , congenital abnormalities, Varicocele, Blockage, Azoospermia, Oligospermia, abnormal sperms, autoimmunity, ejaculatory disorders and Idiopathic infertility.	15

The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

		<p>IV. Treatment of Infertility Removal /reduction of causative environmental factors Surgical treatment, Hormonal treatment- Fertility drugs Assisted Reproductive Technology (ART) In vitro fertilization, Embryo transfer (ET), Intra-fallopian transfer (IFT), Intrauterine transfer (IUT), Gamete intra-fallopian transfer (GIFT), intra-zygote transfer (ZIFT), Intracytoplasmic sperm injection (ICSI) with ejaculated sperm and sperm retrieved from testicular biopsies – Testicular sperm extraction (TESE), Pronuclear stage transfer (PROST), Sperm banks, cryopreservation of gametes and embryos, Surrogacy.</p>	
3	I,II,III, IV,V, VI, VII	<p>Pollution and its effect on organisms I. Air Pollution Types and sources of air pollutant, Effects of air pollution on organisms, its control and abatement measures II. Water Pollution Types and sources of water pollutant, Effects of water pollution on organisms, its control and abatement measures Anthropogenic activities: Oil spillage, Radioactive, Sewage, Industrial, Thermal III. Soil Pollution Types and sources of soil pollutant, Effects of soil pollution on organisms, its control and abatement measures IV. Sound pollution Different sources of sound pollution, Effects of sound pollution on organisms, its control and abatement measures V. Pollution by radioactive substances VI. Pollution by solid wastes Types and sources, Effects of solid waste pollution, its control and abatement measures VII. Pollution – Climate Change and Global Warming</p>	15
		Total No. of Lectures	45

Beyond the syllabus

Tutorial activities: Student's presentations, Use of E-learning and M-learning, Use of animations.



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

SZOP403 (SEMESTER IV)
Based on Paper III-Course 10)

List of experiments	
Sr. No.	Description
1	Study of air microflora.
2	Estimation of Dissolved oxygen from the given water sample.
3	Estimation of Salinity by refractometer from the given water sample.
4	Estimation of conductivity by conductometer from the given water sample.
5	Study of physical properties of soil: temperature, moisture and texture
6	Study of chemical properties of soil- pH, organic matter
7	Study of sound pollution monitoring device
8	Detection of pregnancy from given sample of urine.
9	Study of birth control measures applicable to humans – IUD, condom and hormonal pills.
10	Study of the following permanent slides, museum specimens and materials. a. Mammalian sperm and ovum. b. Egg types –Fish eggs, Frog eggs, and Hen's egg. c. Cleavage, blastula and gastrula (Amphioxus, Frog and Bird).
11	Review writing based on programmes telecasted by Doordarshan, Discovery channel, Gyandarshan, UGC programmes, Animal planet
12	Study of natural ecosystem, anthropogenic activities and field report of the visit.

**Semester IV - Comparative Embryology, Aspects of Human
 Reproduction, Pollution and its effect on organisms
 - SZO403 (Paper III: Course 10) (Internal Assessment Pattern)**

Duration:	Marks: 40
1. Class Test (Based on theory unit 1,2,3)	20 Marks
2. Assignment	15 Marks
3. Class participation and overall conduct	05 Marks

**Semester IV - Comparative Embryology, Aspects of Human
 Reproduction, Pollution and its effect on organisms
 - SZO403 (Paper III: Course 10) (Internal Class Test Paper Pattern)**

Duration:	Marks: 20
Q.1. a) Fill in the blanks (1 or 2 questions each from unit1,2,3)	05 Marks
b) Match the column (1 or 2 questions each from unit1,2,3) Column A 1. 2. 3. 4. 5. Column B a) b) c) d) e)	05 Marks



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Write short note on: (Any two) 1. Unit1 2. Unit2 3. Unit3	10 Marks
--	----------

Semester IV - Comparative Embryology, Aspects of Human Reproduction, Pollution and its effect on organisms - SZO403 (Paper III: Course 10) (Theory Paper Pattern)	
Duration: 2 hrs	Marks: 60
Q.1. a) Fill in the Blanks: (2-3 questions from each Unit) 1. 2. 3. 4. 5. 6. 7. 8.	04 Marks
b) Match the column: (2-3 questions from each Unit) Column A Column B 1. a) 2. b) 3. c) 4. d) 5. e) 6. f) 7. g) 8. h)	04 Marks
Q.1. c) Define: Answer in one sentence: (One/Two from each Unit) 1. 2. 3. 4.	04 Marks
Unit1 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Unit 2 a) Answer the following: (12 marks each) OR a) Answer in brief: (6marks) b) Answer in brief: (6marks)	12 Marks
Q.4. Unit 3	12 Marks



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

<p>a) Answer the following: (12 marks each)</p> <p style="text-align: center;">OR</p> <p>a) Answer in brief: (6 Marks)</p> <p>b) Answer in brief: (6 Marks)</p>	
<p>Q.5. Write Short notes on: (Any four) 2 questions from each Unit</p> <p>a)</p> <p>b)</p> <p>c)</p> <p>d)</p> <p>e)</p> <p>f)</p>	12 Marks

Semester IV - Comparative Embryology, Aspects of Human Reproduction, Pollution and its effect on organisms - SZOP403 (Paper III: Course 10) (Practical Paper Pattern)	
Duration: 5 hrs	Marks: 50
<p>Major Question</p> <p>Q1. Estimation of Dissolved oxygen from the given water sample</p> <p style="text-align: center;">OR</p> <p>Q1. Detection of pregnancy from given sample of urine.</p> <p style="text-align: center;">OR</p> <p>Q1. Determination of organic matter from the given soil sample.</p>	12 Marks
<p>Minor Question</p> <p>Q2. Estimation of Salinity by refractometer from the given water sample</p> <p style="text-align: center;">OR</p> <p>Q2. Estimation of conductivity by conductometer from the given water sample</p> <p style="text-align: center;">OR</p> <p>Q2. Determination the pH of the given soil sample</p> <p style="text-align: center;">OR</p> <p>Q2. Determine the texture of the given soil sample</p>	08 Marks
<p>Q3. Identify and describe as per instructions:</p> <ol style="list-style-type: none"> 1. Permanent slides (a & b) 2. Birth control measure (c) 3. Fishery (d & e) 	15 Marks
Q4. Field report and viva based on it	10 Marks
Q5. Journal	05 Marks

Course Outcome

After the completion of the course, students will able to

CO1 understand and compare the different pre-embryonic stages



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

CO2 appreciate the functional aspects of extra embryonic membranes and classify the different types of placentae.

CO3 understand human reproductive physiology

CO4 correlate different factors responsible for degradation of environment

Recommended Resources

1. Developmental Biology- 5th Edition, Scot F. Gilbert, Sinauer Associates Inc.
2. Developmental Biology- Subramoniam T., Narosa Publishers.
3. Developmental Biology-Berril N.J., Tata Mc Graw –Hill Publication.
4. Essential Reproduction-Martin H. Johnson, Wiley-Blackwell Publication.
5. Chick Embryology- Bradley M. Pattern.
6. Embryology-Mohan P. Arora.
7. Chordate Embryology-Dalela, Verma and Tyagi
8. Human Anatomy and Physiology. E. L. Marieb, Pearson Education Low Price Edition
9. Biological Science. Taylor, Green and Stout. Cambridge Publication
10. Biology. E. P. Solomon, L. R. Berg, D. W. Martin, Thompson Brooks/Cole
11. Human Biology-Daniel D Chiras Jones and Bartlett
12. The Physiology of Reproduction Vol I & II - E.K. Nobil and JU. D.Neil, Raven Press, New York.
13. Air Pollution, Kudesia V.P. Pragati Prakasan, Meerut
14. Fundamentals of Air Pollution Daniel A. Vallero, Academic press 5th Edition
15. Principles and Practices of Air Pollution Control and Analysis J.R. Mudakanil K
16. International Pub. House Pvt. Ltd.
17. Text Book of Air Pollution and its Control, S.C. Bhatia Atlantic
18. Water Pollution, Kudesia V.P., Pragati Prakasan, Meerut
19. A text book of Environmental Chemistry and Pollution Control, S.S.Dogra, Swastic
Pub, New Delhi
20. Practical Methods for water and Air Pollution Monitoring, S.K. Bhargava, New Age International.
21. Hand Book of Water and waste water Analysis, Kanwaljit Kaur, Atlantic
22. Aquatic Pollution by Edward A. Laws
23. Environmental Science and Technology, Stanely E. Manahan
24. Environmental Chemistry, A.K. De, New Age International
25. A Text Book of Environmental Studies, Gurdeep R. Chatwal, Harish Sharma, Madhu
Arora, Himalaya
26. Svedrup et al., The Oceans.
27. Nair N.B. and Thampi D.H., A textbook of marine ecology, T-M-H.3.
28. Harold Thurman, Introductory oceanography, Prentice Hall. London.
29. Newell and Newell, Marine Plankton.
30. Jhingran, Fish and fisheries
31. Carl Schlipper, Research method in marine biology.
32. J.S. Levington, Marine Biology, Function, biodiversity,
ecology. Oxford University Press.



(Dr. S. D. Rathod)
V.C. Nominee



The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Syllabus Prepared by:

1. Dr. B. B. Sharma:

Principal,
KET'S V.G. Vaze College (Autonomous),
Mulund East,
Mumbai

2. Dr. Vinod R. Ragade:

Head, Dept of Zoology,
Associate Professor,
KET'S V.G. Vaze College (Autonomous),
Mulund East,
Mumbai

Chairperson, Syllabus Committee

3. Dr. Kiran Kharat:

Assistant Professor,
Dept. of Zoology,
KET'S V.G. Vaze College (Autonomous),
Mulund East,
Mumbai

4. Dr. Preetha Achary:

Assistant Professor,
Dept. of Zoology,
KET'S V.G. Vaze College (Autonomous),
Mulund East,
Mumbai

5. Ms. Veena Menon:

Assistant Professor,
Dept. of Zoology,
KET'S V.G. Vaze College (Autonomous),
Mulund East,
Mumbai

