Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

New Syllabus

Effective from June 2012-2013 Progressively

B.Sc. (Zoology) Semester System

First Year

(First Semester and Second Semester 2012-2013)

Second Year

(Third Semester and Fourth Semester 2013-2014)

Third Year

(Fifth Semester and Sixth Semester 2014-2015)

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

B.Sc. Zoology Pattern in Semester System

B. Sc. I Year Zoology

Semester	Course Code	Paper No.	Title of Paper	Marks
I	ZOL-101	Paper – I	Protozoa to Annelida	50
	ZOL-102	Paper – II	Cell Biology	50
	ZOL-103	Paper – III	Practical based upon Paper I & II	50
II	ZOL-201	Paper – IV	Arthropoda to Echinodermata And Protochordata	50
	ZOL-202	Paper – V	Genetics - I	50
	ZOL-203	Paper – VI	Practical based upon Paper IV & V	50

B. Sc. II Year Zoology

III	ZOL-301	Paper – VII	Vertebrate Zoology	50
	ZOL-302	Paper – VIII	Genetics- II	50
	ZOL-303	Paper – IX	Practical based upon Paper VII	50
	ZOL-304	Paper – X	Practical based upon Paper VIII	50
IV	ZOL-401	Paper – XI	Animal Physiology (Special Emphasis On animals)	50
	ZOL-402	Paper – XII	Biochemistry & Endocrinology	50
	ZOL-403	Paper – XIII	Practical based upon Paper XI	50
	ZOL-404	Paper – XIV	Practical based upon Paper XII	50

B. Sc. III Year Zoology

V	ZOL-501	Paper –XV	Ecology		50
	ZOL-502	Pape XVI (Elective)	A	Fishery sciences –I	50
			B	Animal culture –I	
			C	Entomology-I	
			D	Parasitic protozoa & helminthes-I	
			E	Computer Application & Laboratory Technology-I	
			F	Biotechnology-I	
			G	Dairy sciences -I	
			H	Poultry Sciences -I	
	ZOL-503	Paper XVII	Practical based upon Paper XV		50
	ZOL-504	Paper XVIII	Practical based upon Paper XVI		50
VI	ZOL-601	Paper XIX	Evolution		
	ZOL-602	Paper XX	A	Fishery sciences –II	50
			B	Animal culture –II	
			C	Entomology-II	
			D	Parasitic protozoa & helminthes-II	
			E	Computer Application & Laboratory Technology-II	
			F	Biotechnology-II	
			G	Dairy sciences -II	
			H	Poultry Sciences -II	
	ZOL-603	Paper XXI	Practical based upon Paper XIX		50
	ZOL-604	Paper XXII	Practical based upon Paper XX		50

B. Sc. First Semester

Course Code - ZOL- 101
Zoology Paper: I

PROTOZOA TO ANNELIDA

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1. Introduction to animal kingdom **03**
   Definition of Zoology, Outline classification
   Protozoa, Parazoa, Metazoa and Major Phyla.

2. Protozoa : - General characters **09**
   Plasmodium vivax: - Structure of sporozoite, Life cycle;
   pathogenecity, Control, Prevention and Treatment of Malaria.
   Entamoeba histolytica: Structure, Life cycle and Control.
   Euglena: Morphology and Reproduction.
   Paramicium: Morphology and Reproduction

3. Porifera : - General characters **08**
   Sycon (Scypha): - Morphology, Different types of cells in sycon,
   canal system in Porifera.

4. Coelenterata: - General characters **06**
   Obelia: - Morphology of Obelia colony, Development of Hydra,
   Polymorphism in coelenterates.

5. Helminths : - General characters **12**
   Fasciola hepatica: - Structure, Life cycle, Pathogenecity & Control Measures
   Taenia solium: - Structure of scolex, Mature and gravid proglottids, Life cycle,
   pathogenecity, and control measures.
   Ascaris lumbricoides: - Structure of male & female, Life cycle,
   Pathogenecity & control measures.

6. Annelida: - General characters **07**
   Leech: - Morphology, Digestive, Excretory & Reproductive systems.

Total Periods 45

B. Sc. First Semester

Course Code - ZOL- 102
Zoology Paper: II

CELL BIOLOGY

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1. General structure of cell. **12**
   - Structure of prokaryotic cell.
   - Ultra structure of eukaryotic cell.
   - Cell Cycle, Mitosis, Meiosis
2. Organization of cell **20**
   - A) Study of Various cell organelles

     Plasma Membrane: - Structure and function.

     Endoplasmic reticulum: - Structure and function.

     Golgi Bodies: - Structure and function

     Mitochondria: - Morphology, Ultra-Structure, function and biogenesis.

     Nucleus: - Structure and function.

     DNA Structure.

     Types of RNA

     Lysosome: - Structure, function and polymorphism

     Ribosome: - Structure and function
   - B) Cytology of Cancer, Types of Cancer.
3. Methods in Cell Biology (in brief) **13**

   A) Light Microscope

   Phase contrast microscope

   Electron microscope

   B) Micro techniques, (Microtomy) Fixation & Staining.

Total Periods 45

Recommended books
Protozoa to Annelida

- Kotpal, R.L. Modern Text Book of Zoology Invertebrates, Rastogi Publication, Meerut.
- Parker & Hashwell, Textbook of Zoology Vol. I (Invertebrates) A.Z.T.B.S. Publishers & Distributors. New Delhi.
- E.L. JORDEN & P.S. VERMA, Invertebrate Zoology, S. Chand & Co. Ltd. New Delhi.
- Hickman C. P. Jr., Hickman & L.S. Roberts. Integrated principles of zoology, Mosby college publication. St. Louis.
- Ayur, E.K., And T.N. Ananthakrishnan, Manual of zoology Vol. I, Invertebrata, Part I and II S.Viswanathan (Printers and Publishers) Pvt. Ltd. Madras.
- Balinsky, an Introduction to Embryology (CBS College Publishers).
- Grant- Biology of Development Systems (Holt. Reihart, Winston).
- Dr. S.S. Lal Practical Zoology Invertebrates 9th edition Rastogi Publications Meerut.

Cell biology

- Albert B. et.al - Molecular Biology of the cell (Sinauer)
- Lodish. H. et al – Molecular Cell Biology.
- Gupta P.K. Cell and Molecular Biology Rastogi Publication Meerut.
- Dr. S.P. Singh, Dr. B.S. Tomar, Cell Biology 9th revised edition Rastogi Publication Meerut.
- Gerald Karp Cell and Molecular biology- Concepts and Experiments. John Wiley, 2007.

B. Sc. First Semester

Course Code - ZOL- 103

Zoology Paper**:** III

PROTOZOA TO ANNELIDA & CELL BIOLOGY (PRACTICAL)

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1. Study of slides from Ciliates, Opalinates, and Flagellates(any five) **01**

2. Study of museum specimen and slides from Porifera to Annelida.
(Three from each phyla) **02**
[Note, Identification, Classification, Sketch & any 3 to 4 points related to (0ne point) habitat (one or two point) structure & (one point from) Biological importance.]

3. Dissection:

- Dissection of Leech for Digestive, Excretory & Reproductive systems. **05**
- Dissection of Earthworm for Nervous System & Reproductive system

4. Mounting of any five of the following. **01**

- Sponge spicules, Gemmule, Obelia colony, Jaws of Leech.
- Spermatica, testes nerve ring of Earthworm, Parapodia of Nereis.

5. Study of cell organelles by using Models, Charts, Slides & Electron micrographs. **01**

6. Squash preparation of Onion root tip to study Mitosis. **01**

7. Preparation of polytene chromosome in chironomous larva/fruit flies. **01**

8. Microtechnique: - Fixation, dehydration, Block preparation, Microtomy and Staining of Rat tissue. **02**

9. Study of Microscopy: - Simple, Compound, & Phase Contrast Microscope **01**

Total Practical Periods 15

Pattern of Question Paper
B. Sc. First Semester
Course Code – ZOL- 101
Zoology Paper: I
PROTOZOA TO ANNELIDA

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter 1& 2
OR	OR
Short Notes on:	Based on chapter 1 & 2
a)	
b)	
Q2. Long answer question.	Based on chapter 3 & 4
OR	OR
Short Notes on:	Based on chapter 3 & 4
a)	
b)	
Q3. Long answer question.	Based on chapter 5&6
OR	OR
Short Notes on:	Based on chapter 5&6
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B. Sc. First Semester
Course Code – ZOL- 102
Zoology Paper: II
CELL BIOLOGY

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. Based on chapter 1
OR OR
Short Notes on: Based on chapter 1
a)
b)

Q2. Long answer question. Based on chapter 2
OR OR
Short Notes on: Based on chapter 2
a)
b)

Q3. Long answer question. Based on chapter 3
OR OR
Short Notes on: Based on chapter 3
a)
b)

Q4. Long answer question. Based on all chapters
OR OR
Short Notes on: Based on all chapters
a)
b)

Q5. Multiple choice questions: Based on all chapters
1)
2)
3)
4)
5)
6)
7)
8)
9)
10)

B. Sc. Second Semester

Course Code – ZOL- 201
Zoology Paper: IV

ARTHROPODA TO ECHINODERMATA AND PROTOCHORDATA

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1. Arthropoda: - General characters **15**

   Prawn: - Structure, Digestive, Nervous, & Reproductive systems.

   Cockroach: External Characters, Digestive, Respiratory and Reproductive systems.

2. Mollusca: - General characters **06**

   Pila: - External Characters, Respiratory, Circulatory, Nervous and Reproductive systems

3. Echinodermata : - General characters **10**

   Asterias (Sea Star): - Morphology of oral & aboral view, Water vascular system, Reproductive system including development.

4. General characters and Classification of Protochordata **14**

   Amphioxus: - External features, Digestive, Circulatory, Reproductive systems including development.

   Hemichordata: - General characters and affinities

   Herdmania: - General characters and morphology

Total Periods 45

B. Sc. Second Semester

Course Code – ZOL- 202
Zoology Paper: V

GENETICS – I

1.	Elements of heredity & variation	**04**
	Definition of genetics and variation Mendel's laws of heredity in short	
2.	Gene interaction	**05**
	Definition- modifications in Mendelian phenotypic ratio like, Epitasis Supplementary gene Complementary gene	
3.	Multiple Alleles	**05**
	Coat Colour in rabbit. ABO Blood group in man, Rh factor	
4.	Cytoplasmic inheritance.	**08**
	Definition of maternal effect. Coiling shell in snail *(Limnea peregra*) Male sterility. CO_2 sensitivity in *Drosophila.* Kappa particles in *Paramecia.*	
5.	Sex Determination	**08**
	Chromosome theory in sex determination Genic balance theory of sex determination Triploid intersexes and Gynandromorphs in *Drosophila.* Sex linked inheritance: X linked and Y linked	
6.	Mutation	**15**
	Brief introduction Gene mutation: - Definition and classification Chromosomal aberration (structural & numerical) Spontaneous & induced mutation	
	Total Periods	**45**

Recommended Books.

ARTHROPODA TO ECHINODERMATA &PROTOCHORDATA

- Kotpal, R.L. Modern Text Book of Zoology Invertebrates, Rastogi Publication, Meerut.
- Parker & Hashwell, Textbook of Zoology Vol. I (Invertebrates) A.Z.T.B.S. Publishers & Distributors. New Delhi.
- E.L. JORDEN & P.S. VERMA, Invertebrate Zoology, S. Chand & Co. Ltd. New Delhi.
- Hickman C. P. Jr., Hickman & L.S. Roberts. Integrated principles of zoology, Mosby college publication. St. Louis.
- Ayur, E.K., And T.N. Ananthakrishnan, Manual of zoology Vol. I, Invertebrata,
- Part I and II S.Viswanathan (Printers and Publishers) Pvt. Ltd. Madras.
- Balinsky, An Introduction to Embryology (CBS College Publishers).
- Grant- Biology of Development Systems (Holt. Reihart, Winston).
- Dr. S.S. Lal Practical Zoology Invertebrates 9th edition Rastogi Publications Meerut.

GENETICS - I

- P.K. Gupta, Genetics- Rastogi Publications Meerut.
- P.K. Gupta, Genetics Classical to Modern- Rastogi Publications Merrut.
- Verma P.S. and V.K. Agarwal, Genetics, S.Chand and Publication.
- Levin O.D. and Lewin R. Biology of Gene McGraw Hill Troppan Co.Ltd.
- Gunther S. Stent. Molecular Genetics McMillan Publication Co.Inc.
- Goodenough V. Genetics New York, Holt Rinchart and Winston.
- Winchester, Genetics Oxford HBH Publication.
- Strikberger, Genetics McMillan Publication
- Sinnott Dunn and Dobzansky- Principles of Genetics

B. Sc. Second Semester

Course Code – ZOL- 203
Zoology Paper: VI

ARTHROPODA TO ECHINODERMATA AND PROTOCHORDATA & CELL BIOLOGY (PRACTICAL)

1.	Study of museum specimen & slides of relevant Invertebrates & Protochordata. (At least 3 from each phylum).	**03**
2.	Dissections:	**05**
➢	Dissection of Prawn for Nervous system	
➢	Dissection of Cockroach for Digestive and Nervous Systems.	
➢	Dissection of Pila for Nervous system.	
➢	Dissection of Sea Star for Water Vascular System.	
3.	Mounting of any five of the following.	**01**
➢	Mouthparts of Cockroach, Mosquito, House fly, Bed bug and Honeybee.	
➢	Salivary glands of cockroach.	
➢	Redula of Pila, Pedicillaria of Star fish.	
4.	Culture of Drosophila- experimental organism in genetics Observation of common mutants of drosophila	**01**
5.	Determination of human blood groups A, B, AB, and O, Rh factor.	**01**
6.	Major and minor problems in genetics	**04**

Practical Periods **15**

Pattern of Question Paper
B. Sc. Second Semester
Course Code – ZOL- 201
Zoology Paper: IV
ARTHROPODA TO ECHINODERMATA AND PROTOCHORDATA

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter 1
OR	OR
Short Notes on:	Based on chapter 1
a)	
b)	
Q2. Long answer question.	Based on chapter 2 & 3
OR	OR
Short Notes on:	Based on chapter 2 & 3
a)	
b)	
Q3. Long answer question.	Based on chapter 4
OR	OR
Short Notes on:	Based on chapter 4
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10	

Pattern of Question Paper
B. Sc. Second Semester
Course Code – ZOL- 202
Zoology Paper: V
GENETICS - I

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. Based on chapter 1 to 3
OR OR
Short Notes on: Based on chapter 1 to 3
a)
b)

Q2. Long answer question. Based on chapter 4 & 5
OR OR
Short Notes on: Based on chapter 4 & 5
a)
b)

Q3. Long answer question. Based on chapter 6
OR OR
Short Notes on: Based on chapter 6
a)
b)

Q4. Long answer question. Based on all chapters
OR OR
Short Notes on: Based on all chapters
a)
b)

Q5. Multiple choice questions: Based on all chapters
1)
2)
3)
4)
5)
6)
7)
8)
9)
10)

Skeleton of question paper
B. Sc. I & II semester
Course Code - ZOL- 103 & 203
Zoology Paper: III + VI

PROTOZOA TO ECHINODERMATA
AND PROTOCHORDATA, CELL BIOLOGY AND GENETICS - I (PRACTICAL)

1. **Time: - 4:00 hrs** **Total marks:-100**

Q.1`	Dissect the……so as to expose it's ……..system	**20**
Q.2	Mounting of squash preparation of Onion root tip, identify the stage and give the reasons OR Mounting of Salivary glands from Chironomus larva / Fruit fly.	**15**
Q3.	Mounting of the given material	
Q.4	Genetics – Major problem	**15**
Q.5	Identify the given spots and comments on it (Protozoa to Echinodetrmata & Protochordata, cell organelles and common mutants)	**30**
Q.6	Submission of permanent slides	**05**
Q.7	Record book	**10**
Q.8	Vivo-vice	**05**

Course Code - ZOL- 301
PAPER: VII

VERTEBRATE ZOOLOGY

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1) Agnatha: - Out line classification and general characters of cyclostomata. **02**

2) Pisces: - Out line classification and general characters. **08**

- Scoliodon: - External characters, Digestive system, Respiratory system, Blood Vascular System and Nervous System.

3) Amphibia: - Out line classification and general characters. **06**

- Development of frog: - Fertilization Cleavage Blastula Gastulation and formation of germinal layers.
- Neotony
- Parental care in amphibia.

4) Reptilia: - Out line classification and general characters. **06**

- Calotes:-External features, Respiratory system and Blood vascular system.
- Poisonous and non- poisonous snakes.

5) Aves: - Out line classification and general characters. **10**

- *Columba livia*: - External features, Respiratory system,
- Embryology of chick.-Cleavage Blastula Gastulation and formation of germinal layers and extra embryonic membranes.
- Flight adaptation in birds.
- Migration in Birds.

6) Mammalia: - Out line classification and general characters. **13**

- *Ratus ratus:* - External features, Blood Vascular System, Urino-genital System and Adaptive radiation in mammals.
- Placentation in Mammals. **Total Periods 45**

B.Sc. III Semester
Course Code - ZOL- 302
PAPER: VIII
G E N E T I C S – II

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1) Genes and its expression :- **08**
- 1.1 Definition, concept and function of gene.
- 1.2 Transcription of gene: - Initiation, elongation and termination.
- 1.3 Genetic code:- Concept of codon, properties of genetic code
- 1.4 Translation of gene: - Initiation, elongation and termination.

2) Population Genetics :- **05**
- 2.1- Gene Pool., Gene Frequency.
- 2.2- Herdy-weinberg's Law.
- 2.3- Application of Herdy-weinberg's Law.

3) Human Genetics: - **12**
- 3.1 Human chromosomes.
- 3.2 Sex linked inheritance- X and Y Linked.
- 3.3 Dizygotic and monozygotic twins.
- 3.4 Inborn errors in metabolism: - PKU, Albinism.
- 3.5 Genetic disorders: - Down's syndrome, Turners' syndrome Klinefelter's syndrome.
- 3.6 Use of human genetics in medical science: - Disease diagnosis Gene therapy and DNA finger printing.

4) Microbial Genetics: - **05**
- 4.1 Transformation.
- 4.2 Conjugation.
- 4.3 Transduction.

5) Genetic Engineering: - **10**
- 5.1 Introduction: - Definition, Concept and significance.
- 5.2 Restriction enzymes: - Concept and types.
- 5.3 Cloning vectors: - Plasmid, cosmid, phase.
- 5.4 Construction of r-DNA.
- 5.5 Application of r-DNA technology.

Total Periods 45

RECOMMENDED BOOKS

GENETICS-II

- Genetics. By Verma, PS and Agarwal, VK., S. Chand and Co., New Delhi
- Principles of Genetics. By. Sinnott, Dunn and Dobzhansky, Tata McGraw Hill, New Delhi India.
- Genetics. By Gupta, PK., Rastogi Publications, Meerut
- Genetics. By Sarin, C., Tata McGraw Hill, New Delhi.
- Principles of Genetics. By Gardner, EJ, Simmons, MJ and Snustad, DP. John Wiley and sons
- Genetics-Strikberger, Macmillan Pub.
- Principles of Genetics- Tamarin, 7th Ed. Tata McGraw Hill.
- Genetics-- Winchester. Oxford IBH Pub
- Introductions genetic analysis – Griffith et.al.

PAPER X: VERTEBRATE ZOOLOGY

- A life of Vertebrate – K.Z.Young, ELBS Oxford University Press.
- Modern Text Book of Zoology Vertebrate – R.L.Kotpal, Rastogi Publication Meerut.
- A Text Book of Chordate Zoology – R.C.Dalela –Jaiprakashnath Publication Meerut.
- Chordate Zoology – E.L.Jordan and P.S.Verma, S.Chand and Company New De
- Zoology- S. A. Miller and J. B. Harley, Tata McGraw Hill.
- Biological Science, 3rd Ed. D. J. Taylor, N. P. O. Green and G. W. Stout, Cambridge Univ. Press. Low priced Ed.
- Verma &Agarwal- chordate Embryology – S.Chand publication.

B.Sc. III Semester

Course Code - ZOL- 303
PAPER: IX
VERTEBRATE ZOOLOGY (Practical)

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1. Museum study of vertebrates. (At least 20). **05**
(Identification, classification, sketches, General characters and biological importance

2. Dissection of Scoliodon / Labeo **03**
- Afferent and efferent,
- Cranial Nerves.
- Brain

3. Dissection of Rat/ Frog ; **05**
- Urinogenital system,
- Arterial system,
- Venous System,
- Brain of Rat.
-

4. Mounting of Placoid, Cycloid and Ctenoid scales of fish **01**

5. Study of Embryological development of chick according to hours of incubation. **01**

6. Visit to Zoological museum/Zoo Park is compulsory and Submission of report

7. Write a report on common birds/mammals in your locality, scientific names and economic importance.

Total Practical periods: - 15

B.Sc. III Semester

Course Code - ZOL- 304
PAPER: X

G E N E T I C S – II (Practical)

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1. Preparation of paper model of DNA and study of DNA structure **01**
2. Study of protein synthesis with the help of charts/models. **02**
3. Estimation of DNA from animal tissue with the help of Diphenyl amine method. **02**
4. Study of preparation of Normal Karyotype of human. **01**
5. Karyotypic study of Down's syndrome, Turner's syndrome, Klinefelter's syndrome with the help of photograph. **02**
6. Detection of Barr body from epithelial cell. **01**
7. Problems on sex linked inheritance **02**
8. Problems based on Hardy – Weinberg's law **02**
9. Study of gene frequency and mutants of man ; **02**
   - Attached and free ear lobe.
   - Colour of eye.
   - Rolling of tongue.
   - Blood group frequency.

Total Practical periods: - 15

Pattern of Question Paper
B.Sc. III Semester
Course Code - ZOL- 301
PAPER: VII
VERTEBRATE ZOOLOGY

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q2. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q3. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q4. Long answer question. Based on all chapters
OR OR
Short Notes on: Based on all chapters
a)
b)

Q5. Multiple choice questions: Based on all chapters
1)
2)
3)
4)
5)
6)
7)
8)
9)
10)

Pattern of Question Paper
B.Sc. III Semester
Course Code - ZOL- 302
PAPER: VIII
G E N E T I C S - II

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q2. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q3. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q4. Long answer question. Based on all chapters
OR OR
Short Notes on: Based on all chapters
a)
b)

Q5. Multiple choice questions: Based on all chapters
1)
2)
3)
4)
5)
6)
7)
8)
9)
10)

B.Sc. IV Semester

Course Code - ZOL- 401
PAPER: XI

ANIMAL PHYSIOLOGY (Special Emphasis on Mammals)

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1) Digestion :- **07**
- Brief Introduction to digestive system.
- Buccal digestion - salivary secretion and digestion.
- Gastric digestion - gastric secretion and digestion.
- Intestinal digestion - Pancreatic secretion, bile juices and digestion in Small intestine, Digestion and absorption in large intestine.

2) Respiration :- **09**
- Respiratory organs.
- Breathing mechanism.
- Respiratory pigments: - Properties and function of respiratory pigments.
- External respiration.
- Internal respiration.
- Transport of gases.

3) Circulation :- **05**
- Working of mammalian heart.
- Blood and its composition.
- Mechanism of blood clotting.

4) Excretion :- **05**
- Structure of kidney.
- Structure of uriniferous tubules.
- Urine formation: - Ultra filtration selective, re-absorption and tubular secretion.
- Counter current multiplier system.

5) Nerve Physiology :- **06**
- Structure of nerve cells and neuron.
- Neurotransmitters.
- Synapses: - Ultra structure and function.

6) Muscles Physiology :- **05**
- Ultra structure of smooth muscle, striated muscles, and cardiac muscles.
- Muscle contraction.
- Simple twitch and fatigue

7) Reproduction :- **08**
- Structure of gonads, Gametogenesis.
- Role of sex hormones in Reproduction.
- Reproductive cycles – oestrous and menstrual cycle

Total Periods 45

B.Sc. IV Semester

Course Code - ZOL- 402
PAPER: XII

BIOCHEMISTRY AND ENDOCRINOLOGY

A-BIOCHEMISTRY

1. Enzymes :- **05**
- Definition, concept and nomenclature,
- Properties, classification,
- Mechanism of enzyme action,
- Factors affecting enzyme action (Temperature, pH, Substrates & Co-enzyme.)

2. Carbohydrates :- **06**
- Definition Classification monosaccharide, disaccharides, oligosaccharides and polysaccharides.
- Metabolism: - Glucogenesis, Gluconeogenesis, Glycolysis, TCA. & oxidative phosphoration.

3. Proteins :- **06**
- Definition , classification -simple , conjugated and derived proteins,
- Structure of proteins: - Primary, secondary, tertiary and quartery.
- Metabolism: - Deamination and transamination.

4. Lipids: - **05**
- Definition, classification, simple, compound and derived lipids.
- Metabolism: - β oxidation and cholesterol biosynthesis .

5. Vitamins: - Sources and deficiency **02**

B- ENDOCRINOLOGY

6. Endocrine system of vertebrates: - **04**
- Introduction: - Definition of endocrine, Paracrine and Autocrine system.
- Significance of endocrine and neuro - endocrine system.

7. Pituitary gland: - Morphology & histological structure, **05**
Hormones and their function.

8. Thyroid gland: - Morphology & histological structure, **03**
Hormones and their function.

9. Adrenal gland: - Morphology & histological structure, **05**
Hormones and their function.

10. Pancreas: - Islets of langarhance- Histological structure **02**
Hormones and their function.

Total Periods 45

RECOMMENDED BOOKS

ANIMAL PHYSILOGY

- William S.Hoar- General and Comparative Physiology, prentice hall of India ltd.
- Wood E.W. Principle of Animal physiology
- Nagbhushnum R.,Sarojini R., Kodarkar M.S. –Animal Physiology
- Verma ,Agarwal & Tyagi-animal physiology
- Moeye K.-Animal Physiology, Cambridge low prize edition.
- Dantzler, W.H. Comparative Physiology (Handbook of Physiology): Vol. 1, 2, (ed.) Oxford University Press, New York, USA
- R. Eckert. Animal Physiology: Mechanisms and Adaptation. W.H.
- Mohan Arora – animal physiology , Himalaya publication
- A.K. Berry. –animal physiology

BIOCHEMISTRY AND ENDOCRINOLOGY

- J.L. Jain –biochemistry S.Chand Publication, meerut
- Lehninger- Biochemistry, Kalyani Publications
- Stryer-Biochemistry, W.H Freeman and Co., New York
- Granner and Rodwell - Harper's Illustrated Biochemistry, Murray, (27th Ed.), McGraw Hill, New York, USA
- Nelson and Cox - Principles of Biochemistry. Lehninger. 2nd Ed. CBS publishers.
- J H Wet - General Biochemistry Wiley Eastern Ltd.
- Rangnatha Rao K-Text Book of Biochemistry, Prentice-Hall of India
- C.B.Powar- Biochemistry – (Himalaya Pub.)
- Das.-Biochemistry
- E.J.W. Barrington, General and Comparative Endocrinology, Oxford, Clarendon Press.
- R.H. Williams, Textbook of Endocrinology, W.B. Saunders

B.Sc. IV Semester

Course Code - ZOL- 403
PAPER: XIII

ANIMAL PHYSIOLOGY (PRACTICAL)

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1. To study the digestive enzymes from cockroach/Human Saliva. **02**

2. Total count of RBC /WBC from given blood sample. **04**

3. Preparation of Heamatin crystals from blood sample. **01**

4. Hb% from given blood sample. **01**

5. Effect of isotonic, hypotonic, and hypertonic solutions on blood cell (RBCs) **01**

6. Detection of nitrogenous west product from the extract of different animals **01**

7. Detection of nitrogenous west product in fish/frog water tank. **01**

8. Estimation of O_2 consumed by fish in relation to temperature by **02**

Wrinkle's method.

9. Typographic reading of skeletal muscle properties , heart beating in Toad / Rat. (Demo only) 01

10. Histological study of following. **01**

- T.S. of Kidney
- T.S. of Testis
- T.S. of Ovaries
- T.S. of Pancreas
- T.S. of Intestine

Total practical periods 15

B.Sc. IV Semester

Course Code - ZOL- 404
PAPER: XIV

BIOCHEMISTRY AND ENDOCRINOLOGY (PRACTICAL)

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1. Preparation of solutions of given percentage, normality and molarity. **02**

2. Study of analytical instrument principle and applications. **04**
- pH meter,
- Colorimeter,
- Centrifuge
- Electrophoresis

3. Factors affecting enzymes activity temperature and pH. **02**

4. Detection of amino acid by paper chromatography. **01**

5. Qualitative test for organic compound. **03**
- Carbohydrate.
- Protein.
- Fats.

6. Quantitative estimation of protein from animal tissue using Lawry's method. **02**

7. Study of permanent histological slides of endocrine glands. **02**
- T.S. of Pituitary gland,
- T.S. of Thyroid gland,
- T.S. of Adrenal Gland,
- T.S. of Islets of langarhance.
- T.S. of Testis
- T.S. of Ovaries

Total practical periods: - 15

Pattern of Question Paper
B.Sc. IV Semester
Course Code - ZOL- 401
PAPER: XI
ANIMAL PHYSIOLOGY (Special Emphasis on Mammals)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1.	Long answer question.	Based on chapter
	OR	OR
	Short Notes on:	Based on chapter
	a)	
	b)	
Q2.	Long answer question.	Based on chapter
	OR	OR
	Short Notes on:	Based on chapter
	a)	
	b)	
Q3.	Long answer question.	Based on chapter
	OR	OR
	Short Notes on:	Based on chapter
	a)	
	b)	
Q4.	Long answer question.	Based on all chapters
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q5.	Multiple choice questions:	Based on all chapters
	1)	
	2)	
	3)	
	4)	
	5)	
	6)	
	7)	
	8)	
	9)	
	10)	

Pattern of Question Paper
B.Sc. IV Semester
Course Code - ZOL- 402
PAPER: XII
BIOCHEMISTRY AND ENDOCRINOLOGY

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q2. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q3. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

SKELETON OF QUESTION PAPER
B. Sc. III&IV semester

Course Code - ZOL-303+403
PAPER: IX+XIII

VERTIBRATE ZOOLOGY+ANIMAL PHYSIOLOGY (PRACTICAL)

Time: - 4:00 hrs **Total marks:-100**

Q.1.	Dissect fish…….. ...so as to expose it's …….system OR Dissect Frog / Rat ……..so as to expose it's …….system	**20**
Q.2	Estimation of O_2 consumption in relation to temperature. OR Detection of any two nitrogenous waste products from the given sample OR Total count of RBC/WBC from given blood sample	**20**
Q.3	Mounting of ……..scale of fish. OR Effect of hypotonic/ isotonic/ hypertonic solution on RBC OR Preparation of haematin crystals from given blood sample	**10**
Q.4	Identification of given spot (Museum study -05. Chick embryo - 02 & histology -03)	**30**
Q.5	Record books	**10**
Q.6	submission of slide (At least five)	**05**
Q.7	Vivo-voce.	**05**

SKELETON OF QUESTION PAPER
B.Sc. III +IV Semester

Course Code - ZOL-304+404
PAPER: X + XIV

GENETICS – II + BIOCHEMISTRY AND ENDOCRINOLOGY (PRACTICAL)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Estimation of total DNA from…….. Tissue OR Problems on sex linked inheritance/ Hardy –Weinberg's law.	**20**
Q.2	Quantitative estimation of Protein from……. Tissue OR Detection of organic compound from given samples A&B .Report the test, observation and results. OR Preparation of DNA model.	**20**
Q.3	Calculates the RF values of given amino acids. (Using paper chromatography) OR Prepare the solutions of given percentage/normality/ molarity (At lest two types) OR Detection of Barr body from epithelial cells.	**15**
Q.4	Identify the given spots and comment. (Syndroms-02. Endocrine glands-03)	**30**
Q.5	record book	**10**
Q.6	Viva-voce	**05**

B.Sc. V Semester
Course Code - ZOL- 501
PAPER: XV
ECOLOGY

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1. Introduction :- **02**
- Definition, basic concept, terminology used in ecology.

2. Abiotic environmental factors. **08**
- Temperature; Concept, temperature fluctuation in different environment. Range of temperature tolerance, effect of temperature on animals, Thermal adaptation.
- Light-Concept, Light variation in different environment, effect of light on animals.
- Adaptation to salinity and moisture

3. Biotic environmental factors :- **08**
- Compitation: - Definition, types, intraspecific and interspecific composition.
- Predation: - Definition, characteristics of predation.
- Commensalisms: - Definition and types with examples.
- Mutualism: - Definition and example.
- Parasitism: - Definition and types with examples.

4. Population :- **06**
- Definition and basic concepts
- Characteristics of population; Density, Natality, Mortality, Dispersion and Age distribution.
- Population growth.
- Population regulation.

5. Community :- **06**
- Definition, basic concept and types.
- Structure of community; producer, consumers and decomposers.
- Characters; ecological niche, diversity, abundance, dominance, ecotone, edge effect.
- Community succession; example of succession and climax

6. Ecosystem :- **15**
- Definition, concept and types.
- Components of ecosystem,
- Dynamics of ecosystem: - primary production, secondary production, food chain, food web, tropic level, energy of flow, ecological pyramids.
- Brief introduction to major ecosystems: - Marine ecosystem, Pond ecosystem, Forest ecosystem and Desert ecosystem.

Total Periods 45

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI - A

FISHERY SCIENCE – I
(Elective Paper)

CAPTURE FISHERIES IN INDIA

1.	**Introduction** Definition and history General characters and classification Concept of blue revolution Importance of fishes.	**05**
2.	Freshwater fisheries. Status of freshwater fisheries, past, present and future Freshwater capture fisheries, cat fishes, rout. Effect of aquatic pollution on fisheries.	**10**
3.	Revering and reservoir fisheries. Major river systems of India Important fisheries of Indian rivers system Major reservoirs of Maharashtra Reservoir fisheries and its management. Exploitation of reservoir fisheries	**10**
4.	Brackish water fisheries Principle fisheries of brackish water, milkfish, mullet, tilapia. Fisheries of the chilka, pulicat and Kolleru Lake	**08**
5.	Marine water fisheries. Oil-sardine Mackeal Ribbon fish fisheries. Bombay-duck Pomfret-fishery	**08**
6.	Application of remote sensing technique in pelagic fisheries.	**04**
	Total periods	**45**

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI – B

ANIMAL CULTURE - I
(Elective Paper)

APICULTURE

1.	Introduction and history	**02**
2.	Status, problems and prospects of Bee-keeping practices	**02**
3.	Systematic position and distribution of different honey bees. a) Wild species b) Domesticated species c) Brief account of honey production	**06**
4.	Organization in colony and polymorphism in Wild species Caste differentiation Division of work	**06**
5.	Life cycle of honey bees Morphology of queen, worker and drone	**06**
6.	Behavior of domesticated bees a) Nesting behavior b) Swarming and colony production c) Communication d) Defense, foraging e) Mating f) Comb construction g) Humidity and temperature control	**08**
7.	Food plants and plant –bee relations. a) Pollination by honey bees.	**04**
8.	Disease, pets, prasites and predators of bees and their control. a) Protozoan diseases-Nosemd Bacterial disease- American and European foul brood Viral disease- sac brood Fungal disease- chalk brood and stone brood b) External mites and dipterans, internal mites c) Bats –was math d) predators- wasps, brinks, rats, lizard, mantis, bears etc. e) Poisoning and pestisidal hazards in bees	**08**
9	bee products and their uses	**03**
	Total periods	**45**

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI - C

ENTAMOLOGY-I
(Elective Paper)

ECONOMIC ENTAMOLOGY

I	Introduction to Economic entamology.	**03**
II	Methods of collection and preservation of insect.	**05**
III	Type study of grasshopper- systematic position, external morphology, digestive, nervous, reproductive system including development.	**08**
IV	Insect –orders (general characters)	**12**
	Thysanura	
	Collembella	
	Lepidoptera	
	Diptera	
	Coeloptera	
	Hymenoptera	
V	House hold and Human insect pest:-	**06**
	Bed bugs, Mosquito, Rat Flea, and House fly, Cockroach, Pediculus.	
VI	Metamorphosis in insect, types of metamorphosis with example.	**05**
VII	Insect Culture (gross study) Apiculture, Sericulture and lac culture	**06**
	Total periods	**45**

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI – D

PARASITIC PROTOZOA AND HELMINTHES - I
(Elective Paper)

A- PARASITIC PROTOZOA

1. Introduction to parasitology :- Definition-Parasite &host, Parasitism, **05**
   Types of parasites, host-parasite relationship
2. Classification of protozoan parasites. **02**
3. Structure, life cycle, Pathogenecity and control measure of the following;
   - *Entamoeba coli* **03**
   - *Entamoeba gingivalis* **03**
   - *Giardia intestinalis* **03**
   - *Trichomonas vaginalis* **04**
   - *Trypanosoma gambience* **04**
   - *Balantidium coli* **03**
   - *Plasmodium vivax* **04**
   - *Plasmodium falcipparium* **04**
   - *Plasmodium ovale* **04**
   - *Plasmodium malariae* ***03***
   - *Eimeria tenella* **03**

Total Periods 45

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI – E

COMPUTER APPLICATION AND MEDICAL LABORATORY TECHNOLOGY- I
(Elective Paper)

A- COMPUTER APPLICATION

1.	History of computer and their application to biology.	**03**
2.	Operating systems DOS, WINDOWS: Windows XP, Windows 7, and UNIX	**07**
3.	System Units: Mother board, Microprocessor and memory.	**05**
4.	Storage Devices, Input/ output devices.	**04**
5.	Microsoft office (2007): MS-word, MS-Power point, MS- Excel, MS- Publisher.	**05**
6.	Internet: Basics, Internet services, WWW services, E-mail services, Search engines.	**05**
7.	Demonstration of web utilities in biology.	**05**
8.	The introduction to programming.	**01**
9.	Programming using "C'.	**02**
10.	"C' Data types.	**03**
11.	Simple programs using C.	**05**

Total Periods 45

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI – F

BIOTECHNOLOGY – I
(Elective Paper)

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1. Introduction to biotechnology **03**
   - Definition and concept
   - Old and new biotechnology
   - Scope and importance, Biotechnology in India.

2. Genetic engineering **04**
   - Concept and definition
   - Steps involved in gene cloning
   - Application

3. Isolation & amplification of desired gene **04**
   - Isolation of DNA from cell
   - Genomic library, cDNA library
   - In vitro synthesis of gene
   - Polymerase chain reaction

4. Enzymes in gene cloning **04**
   - Restriction enzymes (Nomenclature, type)
   - DNA Ligase, taq polymerase, alkaline phosphates
   - Polymerase etc

5. Cloning vectors **04**
   - Plasmid, bacteriophase, cosmid
   - YAC, BAC, shuttle vector, Agro bacterium etc

6. Gene transfer methods **05**
   - Transformation, conjugation, Electrophoration, transfection
   - Liposome mediated gene transfer, Gene gun, microinjection etc

7. Screening of cloned gene **05**
   - Direct selection, Insertional inactivation method
   - Immunological assay, Autoradiography
   - Colony and plaque blotting

8. Problems and solutions for gene cloning **02**

Total periods 45

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI - G

DAIRY TECHNOLOGY – I
(Elective Paper)

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1. Milk:-Definition, Composition, Factors affecting composition of milk **05**
- Food and Nutritive value of milk
- Physico-chemical properties of milk.

2. Microbiology of milk:-Introduction **05**
- Growth and Destruction of microorganisms
- Classification of microorganism.

3. Milk and public health: Introduction **03**
   Safe guarding of milk supply
- Clean milk production.

4. Buying and collection of milk :- **04**
- Introduction , Method of buying, Method of collection
- Cooling of milk
- Transportation of milk.

5. Manufacture, Packaging and storage of Pasteurized milk :- **09**
- Introduction., Milk reception operation, Standardization
- Pasteurization, Homogeuration.
- Packing and storage of milk.

6. Judging and grading of milk:-Introduction **06**
- Importance and procedures.

7. Indian dairy products :- **04**
- Introduction
- Importance and Classification

8. Khoa :-
- Introduction, definition classification and Composition.
- Food and Nutritive Value.
- Methods of production and defects of khoa.

9. Channa :- **04**
- Introduction, definition and Composition.
- Channa Based sweets, Food and Nutritive Value.
- Methods of production.

10. Dahi :- **04**
- Introduction, definition and Composition.
- Channa Based sweets, Food and Nutritive Value.
- Methods of production. **Total Periods** **45**

B.Sc. V Semester

Course Code - ZOL- 502
PAPER: XVI - H

POULTRY SCIENCE- I
(Elective Paper)

1.	Introduction to poultry science.	**02**
2.	Classification of poultry breeds;	**08**
	➢ American	
	➢ Asiatic	
	➢ English	
	➢ Mediterronean.	
3.	Digestive, circulatory, Respiratory and Male and female reproductive system of poultry.	**15**
4.	Formation, structure and nutritive value of eggs.	**06**
5.	Breeding of poultry;	**10**
	➢ Selection	
	➢ Objective	
	➢ Methods of Selection	
	➢ Mating system.	
6.	Management of incubators	**02**
7.	Hatching of eggs.	**02**
	Total Periods	**45**

B.Sc. V Semester

Course Code - ZOL- 503
PAPER: XVII

ECOLOGY (PRACTICAL)

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1. Estimation of productivity of pond ecosystem using white and dark bottle method. **02**

2. Determine the following parameters of soil. **04**

- pH
- Alkalinity
- Chlorinity
- Salinity
-

3. Analysis of DO, CO_2, Salinity, Chlorinity of water sample. **04**

4. Study of animal association ship with example (Charts/photo) -Competition, mutualism, parasitism, predation and commensalisms. **01**

5. Estimation of population density by Quadrate method on field and by Simulation method. **04**

6. Preparation of permanent slides of following
   Spirogyra, Verticella, Odogonium, Daphnia, Cyclops, Mysis, Cypris, *keretella*
   .
7. Project report: - Forest or fresh water ecosystem.

Total practical periods: - 15

B.Sc. V Semester

Course Code - ZOL- 504
PAPER: XVIII - A

FISHERY SCIENCE – I (PRACTICAL)
(Elective Paper)

!. Study of freshwater fishes. **03**
Major carps
Other carps.
Cat fishes
Clupoides

2. Study of brackish water fishes. **02**

Hilsa hilsa, Chanos chanos (milkfish), Latis calcarifer, Tilapia

3. Study of marine ware fishes. **03**
Oil sardine
Mackerel
Ribbon -fish
Bombay-duck
Pomfret
Sole
Polynemus

4. Water analysis **05**

5. Visit to local or any reservoir and marine fish landing centre and student should be submit a project report at the time of practical examination **02**

Total practical periods: - 15

B.Sc. V Semester

Course Code - ZOL- 504
PAPER: XVIII - B

ANIMAL CULTURE – I (PRACTICAL)
(Elective Paper)

1.	Identification of members of bee family	**03**
2	.study of bee hive	**02**
3	study of different types of bees.	**02**
4	mounting of mouth parts and sting apparatus of honey colony.	**04**
5.	Identification of different types of hives and equipment used in apiculture**.**	**04**
	Total practical periods: -	**15**

B.Sc. V Semester

Course Code - ZOO- 504
PAPER: XVIII - C

ENTAMOLOGY – I (PRACTICAL)
(Elective Paper)

1.	Collection and preservation of insects	**02**
2.	Dissection –grasshopper-Digestive system, Nervous system, Reproductive system.	**03**
3.	Mounting: - Mouth parts of Grasshopper, Mosquito, Housefly, Cockroach.	**02**
4.	Museum study- five Human insect pest and representatives of orders: Lepidoptera, coleopteran, Odoneta, Hymenoptera, Orthoptera, with examples.	**04**
5.	Collection of insects (at least 15 specimens should be collected and submitted at the time of examination by students)	**04**
	Total practical periods	**15**

B.Sc. V Semester

Course Code - ZOO- 504
PAPER: XVIII - D

PARASITIC PROTOZOA AND HELMINTHES – I (PRACTICAL)
(Elective Paper)

Parasitic protozoa

1. Study of microscopic structure of the following; **03**
    - *Entamoeba coli*
    - *Entamoeba histolytica*
    - *Opalina*
    - *Nyctotherus*
    - *Balantidium coli*
    - *Trichomonas* species
    - *Trypanosoma* species
    - *Plasmodium* species
    - *Eimeria* species.

2. Smear preparation:- Rat/ Fish blood smear (Giemsa stain) **04**

3. Flagellate parasite from rectum of frog and Calotes with giemsa stain. **04**

4. Ciliate parasite from rectum of frog, smear with iron haematoxxyline or tungesto phosphoric acid for Balantidium Nyctotherus and Opalina. **04**

Total practical periods: - 15

B.Sc. V Semester

Course Code – ZOO - 504
PAPER: XVIII – E

COMPUTER APPLICATION AND MEDICAL LABORATORY TECHNOLOGY- I (Practical)
(Elective Paper)

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1. Demonstration of the use of the following devices:- **03**

   Visual Display Unit (VDU), Key board, Mouse, Light pen, Joystick, Printers, Plotters, Disks, CD-Rom.

2. Use of DOS and windows- manipulating files **02**
3. Use of internet, demonstration of various web sites related to biology. **05**
4. Introduction to programming, editing files, programming in "C'. **05**

Total practical periods: - 15

B.Sc. V Semester

Course Code – ZOO - 504
PAPER: XVIII – F

BIOTECHNOLOGY – I (PRACTICAL)
(Elective Paper)

A) Principle and application of following equipments **04**

1) gel electrophoresis
2) column chromatography
3) high pressure liquid chromatography
4) centrifuge
5) laminar flow
6) spectrophotometer

B) Estimation of total DNA from animal tissue using Diphenylamine method. **02**

C) Estimation of total RNA from animal tissue using orcinol method **02**

D) Isolation of messenger RNA from animal source using affinity chromatography **02**

E) Isolation of total DNA from tissue **01**

F) DNA electrophoresis by agarose gel **02**

G) Demonstration of Animinated methods of following **02**

- Gene cloning
- Restriction digestion of DNA
- Southern blotting techniques
- Northern blotting technique

Total practical periods **15**

B.Sc. V Semester

Course Code - ZOO-504
PAPER: XVIII – G

DAIRY TECHNOLOGY- I (PRACTICAL)
(Elective Paper)

1.	Study of steps for clean and safe milk production.	**01**
2.	Sampling of milk	**01**
3.	Platform test for judging the quality of milk; ✓ Organoleptic test ✓ Temperature ✓ COB test ✓ Alcohol test ✓ Sediment test.	**01**
4.	Determination of fat of milk.	**01**
5.	Determination of SNF and TS of milk.	**01**
6.	Determination of Specific gravity of milk	**01**
7.	Determination of acidity and ph of milk.	**01**
8.	Staining of Bacteria.	**02**
9.	Methyline blue reduction test (MBR) for milk.	**01**
10.	Standard plate count (SPC) of milk. Detection of adulterants and preservative in milk.	**01**
11.	Preparation of khoa.	**01**
12.	Preparation of Chhans	**01**
13.	Preparation of Dahi.	**02**
	Total practical periods	**15**

B.Sc. V Semester

Course Code – ZOO - 504
PAPER: XVIII – H

POULTRY SCIENCE- I (PRACTICAL)
(Elective Paper)

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1. To study American Class poultry breeds.	**01**
2. To study Asiatic Class poultry breeds	**01**
3. To study English Class poultry breeds.	**01**
4. To study Mediterranean Class poultry breeds.	**01**
5. To Study the Circulatory system of Poultry.	**02**
6. To Study the Respiratory system of Poultry.	**02**
7. To Study the Digestive system of Poultry.	**02**
8. To Study the Reproductive (Male and Female) system of Poultry	**02**
9. To Study Formation of egg.	**02**
10. To Study Structure of egg.	**01**
Total practical periods	**15**

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 501
PAPER: XV
ECOLOGY

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q2. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q3. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI - A
FISHERY SCIENCE – I (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1.	Long answer question.	Based on chapter
	OR	OR
	Short Notes on:	Based on chapter
	a)	
	b)	
Q2.	Long answer question.	Based on chapter
	OR	OR
	Short Notes on:	Based on chapter
	a)	
	b)	
Q3.	Long answer question.	Based on chapter
	OR	OR
	Short Notes on:	Based on chapter
	a)	
	b)	
Q4.	Long answer question.	Based on all chapters
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q5.	Multiple choice questions:	Based on all chapters
	1)	
	2)	
	3)	
	4)	
	5)	
	6)	
	7)	
	8)	
	9)	
	10)	

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI – B
ANIMAL CULTURE - I (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q2. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q3. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
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9)	
10)	

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI - C
ENTAMOLOGY - I (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q2. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q3. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q4. Long answer question. Based on all chapters
OR OR
Short Notes on: Based on all chapters
a)
b)

Q5. Multiple choice questions: Based on all chapters
1)
2)
3)
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Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI - D
PARASITIC PROTOZOA AND HELMINTHS – I (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q2. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q3. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
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Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI – E
COMPUTER APPLICATION & LAB. TECHNOLOGY- I (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q2. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q3. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI – F
BIOTECHNOLOGY – I (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q2. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q3. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI - G
DAIRY TECHNOLOGY- I (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q2. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q3. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. V Semester
Course Code - ZOL- 502
PAPER: XVI – H
POULTRY SCIENCE - I (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1.	Long answer question. OR Short Notes on: a) b)	Based on chapter OR Based on chapter
Q2.	Long answer question. OR Short Notes on: a) b)	Based on chapter OR Based on chapter
Q3.	Long answer question. OR Short Notes on: a) b)	Based on chapter OR Based on chapter
Q4.	Long answer question. OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q5.	Multiple choice questions: 1) 2) 3) 4) 5) 6) 7) 8) 9) 10)	Based on all chapters

B.Sc. VI Semester

Course Code – ZOL - 601
PAPER: XIX

EVOLUTION

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1. Concept of organic evolution :- **06**
   - Definition and concept.
   - Theories of organic evolution in brief; Preformation theory, Bear's Law, Biogenetic law, catastrophism, Lamarckism, Darwinism and Germplasm theory.
2. Origin of Life :- **03**
   - Definition, Abiogenesis, Biogenesis.
   - Chemical evolution of life.
3. Evidences of Organic Evolution :- **04**
   - Anatomical evidences.
   - Embryological evidences.
4. Darwinism :- **05**
   - Introduction :- Natural selection theory,
   - Artificial selection theory and sexual selection theory.
5. Elemental forces of evolution :- **07**
   - Mutation: - Concept and role in evolution.
   - Recombination: - Concept and role in evolution.
   - Natural selection: - Concept and role in evolution.
   - Isolation: - Concept and role in evolution.
   - Genetic Drift. : - Concept and role in evolution.

6. Basic patterns of evolution :- **09**
   - Sequential and divergent evolution.
   - Microevolution: - Concept, silent features and mechanism with example.
   - Macro evolution: - Concept, silent features and mechanism with example.
   - Mega evolution: - Concept, silent features and mechanism with example.

7. Species and speciation:- **07**
   - Species: - Morphological concept, Genetical concept, biological concept of species
   - Speciation: - Definition, concept, mechanism of speciation.
   - Allopatric, Sympatric and Parapatric speciation.
8. Fossils :- **04**
   - Definition , fossil formation
   - Types of fossils.

Total Periods 45

B.Sc. VI Semester

Course Code - ZOL- 602
PAPER: XX - A

FISHARY SCIENCE – II
(Elective Paper)

FISH CULTURE AND FISH TECHNOLOGY

A. fish culture

1. Introduction **15**
   a) Types of freshwater ponds-perennial and seasonal.
   b) Different types of ponds-nursary, rearing and stoking ponds.
   c) Design, contruction and maintenance of nursery, rearing and stocking ponds.
   d) Productivity of ponds
   e) principles of fish collection
   f) Fish culture methods
   g) Culture – cat fisheries
   h) Sewage fed fisheries

2. Fish crop production (fish diseases) **06**
   Protozoan, fungal, bacterial, viral worms diseases
3. Breeding of fishes **08**
   a) Natural spawning of carps
   c) Artificial breeding by hypophysation
   d) Common carp breeding

B. fish technology

4. Fish preservation and processing **08**
   a) Fish processing methods
   b) Fish –spoilage
   c) Value added products
   d) Sanitation and HACCP

5. Crafts and gears **08**
   a) Different types of gears
   b) Different types of crafts
   c) Preservation of gears

Total Periods 45

B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XX - B
ANIMAL CULTURE – II (Elective Paper)

SERICULTURE

1. History and general account of sericulture industry **02**
   Status, scope and problems of sericulture industry in India and Maharashtra. **02**
2. Different types of silkworms, their systematic position and distribution. **03**
3. life cycle of mulberry silk worm
4. Morphology of different stages of B. mori. - Egg and types, larva, pupa, adult. **03**
5. structure and working of silk gland **02**
6. Food plants. **10**
   Brief account of food plants required for non –mulbabary silk worms.
   Systematic position mad morphology of mulberry plant.
   Selection of variety, preparation of planting material
   Agro climate condition required for plantation
   Methods of plantation (mulberry cultivation)
   Maintenance of mulberry garden (irrigation and rainfed)
   Common diseases and pest of mulberry and their control.
   Harvesting and preservation of leaves
7. silk worm rearing **10**
   Rearing house, model rearing house and others.
   Rearing equipments and their uses.
   Disinfection of rearing house and equipments
   Egg incubation, buck boding and its importance.
   Hatching and brushing of larvae, methods of brushing
   Feeding and its schedule
   Bed cleaning, methods of bed cleaning
   Role of environmental conditions in rearing
   Moulting, care taken during moultiong
   Spacing and its schedule
   Mounting spinning, harvesting of cocoon
   Transportation and marketing of cocoon.
8. Important diseases, pest of silk worm and their control:- **04**
   Bacterial, fungal, viral, protozoan
   Pest predators- beetle, mites, ants, lizards, birds, rats etc **02**
10. Introduction to post harvesting technology (reeling) **06**
    Cocoon stifing, methods of stifing.Preservation and storage of cocoons.Cocoon cooking, methods of cocoon coking
    Reeling- country charkha, filature.
11. Sericulture as agro cottage, employment generating village industry. **01**
12. Economics of sericulture. **01**

Total Periods 45

B.Sc. VI Semester

Course Code - ZOL- 602
PAPER: XX - C

ENTAMOLOGY – II
(Elective Paper)

PEST MANAGEMENT

I	pest –Definition, types of pest, agricultural, veterinary and medical pest.	**06**
II	study of major crop pest: - Classification, Characters. Jawar- Stem borer, Midge flies Cotton- Red cotton bug, pink bollworm Groundnut-White grub**,** pod sucking bug Sugarcane- Pyrilla, Stem borer.	**12**
III	Study of Stored grain pests: Rice weevil, pulse bettle	**08**
IV	Control measures of insect pest. Methods of control measures-Chemical, Biological, integrated pest management.	**08**
V	migration of insect.	**03**
VI	Insecticides and plant protection appliances like Hand compression spray, Hand rotating duster, bucket pump	**08**
	Total Periods	**45**

B.Sc. VI Semester

Course Code - ZOL- 602
PAPER: XX - D

PARASITIC PROTOZOA AND HELMINTHES – II
(Elective Paper)

B- PARASITIC HELMINTHES

1. General characters and classification of helminthes **02**
2. Structure ,life history, pathogenecity and control measure of the following;
   - *Schistosoma haematobium* **03**
   - *Taenia Saginata* **03**
   - *Echinococcus granulossus* **03**
   - *Trichinella spiralis* **03**
   - *Enterobius vrmicularis* **03**
   - *Ancylostoma duodenale* **02**
   - *Wuchereria bancroftii* **03**
   - *Dracunculus medinensis*. **01**
3. Gross morphology of Trematoda Cestoda and Nematode. **06**
4. Reproductive organs of Trematodes Cestodes and Nematodes. **06**
5. Body wall of Trematodes Cestodes and Nematodes. **06**

Total periods: - 45

B.Sc. VI Semester

Course Code – ZOL - 602
PAPER: XX - E

COMPUTER APPLICATION AND MEDICAL LABORATORY TECHNOLOGY - II
(ELECTIVE PAPER)

B-MEDICAL LABORATORY TECHNOLOGY

1. Basic Laboratory principles and procedure. **08**

Introduction

Laboratory management system.

Responsibility of laboratory worker.

Laboratory safety and aids and Training of technician.

2. Basic requirement of Laboratory. **12**

Glassware, solution and reagent, equipment and instruments.

(Autoclave, Hot air oven, Incubator, Water bath Centrifuge, Colorimeter, PH meter, Haemoglobometer, Micrometer, Glocometer.)

3. Routine examination of body fluids. **10**

Collection and examination procedure /method with special reference to clinical significance.

Blood, HB percentage, WBC, RBC count, Homeostasis (mechanism of blood coagulation).

Urine- Physical examination (Color and Odour),Chemical examination

(Protein, Glucose, Bilurubin, Uroblinogene Blood, Ketone bodies, Acetone bodies)

Sputum- Microscopic examination.

Semen- Microscopic examination, Sperm count, Sperm motility, Sperm morphology, Examination for the presence of semen.

4. Basic histopathological techniques. **10**
Collection, fixation, preparation of tissue for section

Staining and observations with critical comments.

5. Scope and importance of laboratory technique in clinical field of medical science. **05**

Total Periods: - 45

B.Sc. VI Semester Course

Code - ZOL - 602
PAPER: XX – F

BIOTECHNOLOGY - II
(Elective paper)

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1. Animal cell culture **06**
   - Basic requirements, Culture media & sterilization
   - Contamination and sterilization of laboratory.
   - Application and limitations of cell culture

2. Manipulation of reproduction and transgenic animals **05**
   - Invitro fertilization, nuclear transplantation (Dolly sheep)
   - Transgenic animals –methods
   - (Retroviral vector method, microinjection and ES cell methods)

3. Protein engineering **06**
   - Site-directed mutagenesis (Cassette mutagenesis oligonucliotide directed)
   - Applications of mutagenesis, Hybrodoma technology
   - Commercial production of enzymes

4. Gene therapy and DNA fingerprinting **06**
   - Introduction, ex vivo, in vivo gene therapy
   - Antigene &antisence gene therapy
   - DNA fingerprinting

5. Human disease-diagnosis using biotechnology **02**

6. Applications of biotechnology **06**
   - Agriculture
   - Medicine
   - Industry

Total Periods: - 45

B.Sc. VI Semester

Course Code - ZOL- 602
PAPER: XX - G

DAIRY TECHNOLOGY – II
(Elective paper)

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1. Concentrated indigenous dairy products :- **08**

- Definition, Composition, Methods of production and yield of Peda, Burfi, Rabdi, Basundi and Gulabjamun.

2. Fermented indigenous dairy product: - **05**

- Definition, Composition, Methods of production and yield of Chakka, Shrikhand and Shrikhand wadi.

3. Frozen indigenous dairy product: - **06**

- Definition Composition, Methods of production and yield of Kulfi, Malai ka Barf.

4. Fat rich indigenous dairy product: - **06**

- Definition Composition, Methods of production and yield of Butter and Ghee.

5. Special milk :- **10**

- Definition Composition and Methods of production of Milk Shake, Flowered milk, Toned milk, Fortified milk, Recombined milk and Soya milk.

6. Study of microbial toxins in dairy products **05**

7. Role of dairy industry as on entrepreneur for development of small scale industry. **05**

Total Periods
45

B.Sc. VI Semester

Course Code - ZOL- 602
PAPER: XX - H

POULTRY SCIENCE - II
(Elective Paper)

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1. Poultry Management ; **10**

- Brooder management.:- Housing, sanitation&hygine,litter, Temperature space
- Grower management.
- Layer management.
- Rising of Broilers.

2. Housing for poultry; **14**

- selection site for poultry form
- Free range or extensive system.
- Semi intensive system.
- Intensive system.
- Folding System

3. Feeding of poultry. **05**

Requirement of poultry feed, feed ingredients,
Conventional and nonconventional poultry feed

4. Processing of poultry products. Preservation of poultry products. **05**
5. Marketing of poultry products. **03**

6. Poultry diseases; **08**

Parasitic, Protozoan
Bacterial, Fungal.

Total Periods **45**

B.Sc. VI Semester

Course Code – ZOL - 603
PAPER: XXI

EVOLUTION (PRACTICAL)

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1. Embryological evidences of evolution with the help of slide/chart/pictures. **02**

2. Adaptive modification in feets of birds and mouth parts of insects **02**

3. Study of successive stages of evolution with the help of models/charts **02**
   - Horse
   - Human

4. Discussion on patterns of speciation with the help of charts /pictures. **02**
   - Allopatric speciation
   - Sympatric speciation.

5. Study the homologous and analogous organs. **04**

6. Study of natural selection using *E.coli* bacteria against antibiotics (Tetramycin/ Penicillin) **01**

7. Study of geographical era. **02**

Total Practical periods 15

B.Sc. VI Semester Course

Code - ZOL- 604
X PAPER: XII – A

FISHARY SCIENCE – II (PRACTICAL)
(Elective Paper)

1.	Primary productivity of ponds (plankton studies).	**02**
2	identification, classification and culturaable significance of following. Catla, rohu, mrigal, catfishes, exotic canoj	**03**
3	Collection and identification of fish parasites and worms.	**04**
4	Removal of fish pituitary gland and preparation of pituitary extract	**02**
5	Identification of crafts and gears. Gill net, Rampanni, Satpalti, Machwa, Catamaran.	**02**
6.	A visit to fish farm and fish processing centre is compulsory.	**02**
	Total Practical Periods	**15**

B.Sc. VI Semester Course

Code - ZOL- 604
X PAPER: XII – B

ANIMAL CULTURE – II (PRACTICAL)
(Elective Paper)

1.	Different stages of silk worm from egg to adult.satges (egg, sheet diff. ages of the larvae, pupa and adult.)	**03**
2.	Dissection of the silkworm to study the internal anatomy and mounting the silk glands, mounting of mouth parts spinner ate spiracle etc.	**02**
3.	Study of disease causing pests of larvae, pupa and adult.	**03**
4.	Equipment needed in silkworm rearing centre.	**02**
5	mulberry leaves and utilization and study of mulberry varieties.	**02**
6.	Preparation of model of life cycle of *bombex mori* and submition at the time of Examination.	**03**
	Total Practical Periods	**15**

B.Sc. VI Semester Course

Code - ZOL- 604
PAPER: XXII – C

ENTAMOLOGY – II (PRACTICAL)
(Elective Paper)

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1. Collection, preservation and identification of Major crop pests (any five) **05**

   Jawar- Stem borer, Midge flies.

   Cotton- Red cotton bug, pink bollworm

   Groundnut-White grub, pod sucking bug

   Sugarcane- Pyrilla,

2. Identification of common stored grain pests. **02**

   A- Rice Weevil
   B- Rice bettle
   C- Grain moths

3. Study of common plant protection appliances like Sprayers and dusters. **02**

4. Collection of major crop pests in locality and submission at the time of examination. **04**

5. Visit of an agricultural Field and field study report. **02**

Total Practical Periods 15

B.Sc. VI Semester Course

Code – ZOL - 604
XXII PAPER: – D

PARASITIC PROTOZOA AND HELMINTHES – II (PRACTICAL)
(Elective Paper)

B-PARASITIC HELMINTHES

1. Study of microscopic structure of the following; **03**

- ✓ *Schistosoma* Species
- ✓ *Fasciola hepatica*
- ✓ Redai larva
- ✓ Cercaria larva
- ✓ V.S. Body wall of Fasciola.
- ✓ *Mehrorchis*
- ✓ *Ganeo*
- ✓ *Tremorchis*
- ✓ *Paramphistomum*
- ✓ *Taenia Saginatta*
- ✓ *Echinococcus granulosus*
- ✓ Scolex of *Taenia solium* and *Taenia saginatta.*
- ✓ Mature proglottids
- ✓ Gravid proglottids
- ✓ Hexacanth Larva
- ✓ Body wall of tape worm
- ✓ *Enterobius vermicularis*
- ✓ *Ascaris lumbricoides* (Specimen)
- ✓ T.S. of Body wall of *Ascaris*
- ✓ T.S. of *Ascaris* Male and Female
- ✓ *Ancylostoma* W.M.
- ✓ Microfilaria W.M.
- ✓ T*richinella spiralis*

2. Collection preservation staining and identification of the Trematode parasite from the rectum of frog. **04**

3. Collection preservation staining and identification of the Cestode parasite from the chick intestine **04**

4. Collection, preservation, mounting and identification of the Nematode parasite from the vertebrate. **04**

Total Practical periods: - 15

B.Sc. VI Semester Course

Code - ZOL- 604
PAPER: XXII - E

COMPUTER APPLICATION AND MEDICAL LABORATORY TECHNOLOGY – II
(PRACTICAL)
(Elective Paper)

MEDICAL LABORATORY TECHNOLOGY

1. Study of laboratory equipments. **02**

Autoclave, hot air oven, incubator water bath,

Centrifuge, refrigerator, colorimeter, PH meter,

Haemoglobinometer, microtome, and Glocometer.

2. Preparation of various reagents and fixatives. **02**

3. Histological techniques: preparation of biological material,

Fixing, embedding sectioning, staining, and mounting. **02**

4. Study of blood pressure apparatus, stethoscope. **03**

5. Blood analysis- Hb percentage

, Counting of WBC and RBC, Homeostasis. **03**

6. Urine analysis- Protein, Glucose, Bilurubin, Blood,

Ketone bodies, Acetone bodies,

Or any other normal and abnormal constituent. **03**

Total Practical periods: - 15

B.Sc. VI Semester Course

Code - ZOL- 604
PAPER: XXII – F

BIOTECHNOLOGY- II (PRACTICAL)
(Elective Paper)

A-	Sterilization of glassware and chemicals in tissue culture	**03**
B-	Preparation of culture media and sterilization	**02**
C-	Assay of cell viability using dye.	**02**
D-	Effect of pH on acid phosphatase activity	**02**
E-	Study of chromosomal aberration	**01**
F-	Pure Culture of airborne/water bacteria.	**02**
G-	Study of antibiotic resistant /susceptibility of bacterial culture.	**01**
H-	Demonstration of Animinated methods of following Nuclear transplantation Hybrodoma technique DNA fingerprinting Bt- cotton	**02**
	Total Practical Periods	**15**

B.Sc. VI Semester Course

Code - ZOL- 604
PAPER: XII – G

DAIRY TECHNOLOGY- II (PRACTICAL)
(Elective Paper)

1.	Preparation of Peda.	**01**
2.	Preparation of Burfi.	**01**
3.	Preparation of Rabdi.	**01**
4.	Preparation of Bassundi.	**01**
5.	Preparation of Gulab Jamun.	**01**
6.	Preparation of Chakks.	**01**
7.	Preparation of Shrikhand.	**02**
8.	Preparation of Shrikhandwadi.	**01**
9.	Preparation of Kulfi.	**01**
10.	Preparation of Butter (Makhan).	**01**
11.	Preparation of Ghee.	**01**
12.	Preparation of Milk Shake.	**01**
13.	Flavored milk.	**01**
14.	Soya Milk.	**01**

Total Practical Periods 15

B.Sc. VI Semester

Course Code - ZOL- 604
PAPER: XXII - H

POULTRY SCIENCE – II (PRACTICAL)
(Elective Paper)

1.	To study Poultry housing system.	**03**
2.	To identify and study feed ingredients	**02**
3.	To preservation of eggs.	**02**
4.	To study Protozoan diseases.	**01**
5.	To study parasitic diseases.	**01**
6.	To study Bacterial diseases.	**01**
7.	To study fungal diseases.	**01**
8.	to compute ration for chicken	**01**
9.	to identify equipments in poultry farm	**01**
10.	visit to poultry farm	**01**

Total Practical Periods 15

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 601
PAPER: XIX
EVOLUTION

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q2. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q3. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q4. Long answer question. Based on all chapters
OR OR
Short Notes on: Based on all chapters
a)
b)

Q5. Multiple choice questions: Based on all chapters
1)
2)
3)
4)
5)
6)
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9)
10)

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XXII - A
FISHARY SCIENCE - II (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q2. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q3. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q4. Long answer question. Based on all chapters
OR OR
Short Notes on: Based on all chapters
a)
b)

Q5. Multiple choice questions: Based on all chapters
1)
2)
3)
4)
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9)
10)

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XXII - B
ANIMAL CULTURE – II (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q2. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q3. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XXII - C
ENTAMOLOGY – II (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1.	Long answer question.	Based on chapter
	OR	OR
	Short Notes on:	Based on chapter
	a)	
	b)	
Q2.	Long answer question.	Based on chapter
	OR	OR
	Short Notes on:	Based on chapter
	a)	
	b)	
Q3.	Long answer question.	Based on chapter
	OR	OR
	Short Notes on:	Based on chapter
	a)	
	b)	
Q4.	Long answer question.	Based on all chapters
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q5.	Multiple choice questions:	Based on all chapters
	1)	
	2)	
	3)	
	4)	
	5)	
	6)	
	7)	
	8)	
	9)	
	10)	

Pattern of Question Paper
B.Sc. VI Semester
Course Code – ZO - 602
PAPER: XXII - D
PARASITIC PROTOZOA & HELMINTHS – II (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q2. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q3. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q4. Long answer question. Based on all chapters
OR OR
Short Notes on: Based on all chapters
a)
b)

Q5. Multiple choice questions: Based on all chapters
1)
2)
3)
4)
5)
6)
7)
8)
9)
10)

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XXII - E
COMPUTER APPLICATION & LABORATORY TECHNOLOGY – II (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q2. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q3. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XXII - F
BIOTECHNOLOGY – II (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q2. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q3. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XXII – G
DAIRY SCIENCE - II (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q2. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q3. Long answer question. Based on chapter
OR OR
Short Notes on: Based on chapter
a)
b)

Q4. Long answer question. Based on all chapters
OR OR
Short Notes on: Based on all chapters
a)
b)

Q5. Multiple choice questions: Based on all chapters
1)
2)
3)
4)
5)
6)
7)
8)
9)
10)

Pattern of Question Paper
B.Sc. VI Semester
Course Code - ZOL- 602
PAPER: XXII – H
POULTRY SCIENCE-II (Elective Paper)

Time: 03:00 hours **Max. Marks: 50**

N.B. 1) Attempt all questions.
2) All question carry equal marks.
3) Illustrate your answer with suitable labeled diagram.

Q1. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q2. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q3. Long answer question.	Based on chapter
OR	OR
Short Notes on:	Based on chapter
a)	
b)	
Q4. Long answer question.	Based on all chapters
OR	OR
Short Notes on:	Based on all chapters
a)	
b)	
Q5. Multiple choice questions:	Based on all chapters
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

B.Sc. V + VI Semester

Course Code - ZOL- 503 + 603
PAPER: XVII + XXI

ECOLOGY + EVOLUTION (PRACTICAL)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Estimation of ……..of water sample. (DO/ CO_2,/salinity/Chorinity) OR Estimation of primary productivity of pond water OR Estimation of …….of Soil sample. (Alkalinity / Chlorinity / Salinity)	**20**
Q.2	study of natural selection of E.coli against……..antibiotics OR Comment on successive stages of evolution of Horse/ man	**20**
Q.3	Calculate the population density of given sample using Quadrate method. OR Identify and comment on homologous organs and analogous organs. (Any two)	**10**
Q.4	Identify the given spots and comment on it. (Embryological evidence -01, Adaptive modification- 02, Animal associationship- 02)	**25**
Q.5	submission of permanent slides (At least five)	**10**
Q.6	Record book	**10**
Q.7	Vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester

Course Code - ZOL-504+604
PAPER: XVIII – A + XXII – A

FISHERY SCIENCES-I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Estimation of ……from given water sample. (DO, Alkalinity, chlorinity, Hardness, etc.)	**15**
Q.2	Identify any four primary producers from given sample OR Dissection of ……fish to expose its pituitary gland.	**15**
Q.3	Collection and Identification of ……..parasites from fish. OR Identify and comments on crafts and gars.	**15**
Q.4	Identify and comments on given Spots. (Major carp-03, brackish water-02, Marine water-03 culturable -02)	**30**
Q.5	submission of project report	**10**
Q.6	record book	**10**
Q.7	Vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester

Course Code - ZOL-50 4+ 604
PAPER: XVIII – B + XXII – B

ANIMAL CULTURE –I& II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Identify the types of bee hives and equipments used in apiculture. OR Identify and comments on bee hive.	**15**
Q.2	Dissection of silkworm so as to expose its silk gland	**15**
Q.3	Mounting of supplied material and write procedure followed.	**10**
Q.4	Identification of given pests of silkworm and write their consequences.	**10**
Q.5	Identify the given spots and comments on it (Equipments in apiculture-02, silkworm stages-01, types of bee -02)	**25**
Q.6	submission of model	**10**
Q.7	record book	**10**
Q.8	Vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester

Course Code - ZOL-504 + 604
PAPER: XVIII – C + XXII – C

ENTAMOLOGY – I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Dissection of ----------system of grasshopper. Leave the well labeled Diagram of the same.	**15**
Q.2	study of major crop pest	**15**
Q.3	Mounting / temporary preparation of supplied material	**10**
Q.4	Identify and describe (any five) (Stored grain pest-03, plant protection appliances-02)	**15**
Q.5	Identify and comment on given spots. (Insect specimen-03, human insect pest-02)	**20**
Q.6	submission of collected insect and agricultural and field report	**10**
Q.7	record book	**10**
Q.8	vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester

Course Code - ZOL-504 + 604
PAPER: XVIII – D + XXII – D

PARASITIC PROTOZOA & HELMINTHS – I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1 collect and identify …….protozoan from rectum of ……. **25**

OR

Prepare the blood Smear and identify parasitic protozoa from it.

Q.2 Dissect ……and identify ……. helminthes
(Frog rectum /chick intestine). **20**

OR

Dissect the given fish and identify the Helminthes from it.

Q.3 Identify the given helminthes larvae and comment on it. **10**

Q.4 identify the given spots and comments on it **30**

Q.5 record book **10**

Q.6 vivo-vice **05**

Skeleton of question paper
B.Sc. V+VI Semester

Course Code - ZOL- 504 + 604
PAPER: XVIII – E + XXII – E

COMPUTER APPLICATION AND
LABOLATORY TECHNIQUES –I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Demonstrates any five DOS commands on computer and writes their syntax. OR Demonstrate and use of any two window commands	**20**
Q.2	Give WBC/ RBC count of given blood sample write the procedure OR Find out the constitute of given urine sample and write the procedure	**20**
Q.3	prepare the data sheet of given data on Excel sheet OR Search…….. on internet and show to Examinar. (Keyword related to zoology like ecosystem, urine formation, gene etc)	**10**
Q.4	preparation of given solutions /fixative and write procedure followed for it. OR Preparation of block of given tissue for microtome	**10**
Q.5	Identify the given Spots and comments on it. (Computer hard-were - 03/ lab. Instruments -2)	**25**
Q.6	Record book	**10**
Q.7	Vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester

Course Code - ZOL-504+604
PAPER: XVIII – F + XXII – F

BIOTECHNOLOGY – I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Estimation of total DNA from ……tissue of ……..	**25**
	OR	
	Isolation of messenger RNA from……tissue of……..	
	OR	
	Isolation of total DNA from…….. tissue of ……	
Q.2	preparation of culture media for animal culture	**25**
	OR	
	Sterilization of …… for tissue culture and write procedure. (Chemical / glassware/ lab)	
	OR	
	Effect of pH on acid phosphatase activity and Record the observation	
Q.3	writes principle and application of……..	**20**
	OR	
	Assay of cell viability using…….dye.	
	OR	
	Observation of susceptibility/resistant of…….. antibiotic to bacterial stain.	
Q.4	study of chromosomal aberration	**15**
Q.5	Record book	**10**
Q.6	Vivo-vice	**05**

Skeleton of question paper
B.Sc. V+VI Semester

Course Code - ZOL-504+604
PAPER: XVIII – G + XXII – G

DAIRY SCIENCES – I & II (PRACTICAL)
(Elective Paper)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Insure the quality of given milk sample using……methods (At least two methods) OR Determine the amount of fat in given milk sample.	25
Q.2	Prepare …….from milk	20
Q.3	Determine the ……..of milk (any one) (Acidity, TS, SNF, MBR, SPC) OR Prepare …… from milk.	10
Q.4	Identify and comments on following spots. (Milk products)	30
Q.5	Record book	10
Q.7	vivo-vice.	05

Skeleton of question paper
B.Sc. V+VI Semester

Course Code - ZOL-504 + 604
PAPER: XVIII – H + XXII – H

POULTRY SCIENCES –I & II (PRACTICAL)

Time: - 4:00 hrs **Total marks:-100**

Q.1	Identify and comment of given poultry breed	**20**
	OR	
	Identify and comment on ……system of poultry.	
	Leave the well labeled diagram of it.	
Q.2	Identify and comment on equipments in poultry farm.	**20**
Q.3	Identify the Stages of egg formation and comment on it.	**15**
	OR	
	Explain the poultry house system.	
Q.4	Identify the given spots and comment on it.	**30**
	(Food ingredients-05/disease causing agents-05)	
Q.5	Record book	**10**
Q.6	vivo-vice	**05**

RECOMMENDED BOOKS

ECOLOGY

- Chapman – Ecology- Cambridge low prize Edition.
- Verma and Agarwal- Principles of ecology
- Koromondy, E.J. Concepts of ecology. Prentice Hall, New Delhi.
- Clarke, G.L. Elements of Ecology, John Wiley & Sons, New York.
- Odum, E.P. -Fundamentals of Ecology. W.B. Saunders, Philadelphia.
- Krebs, C.J. -Ecology. Harper & Row, New York.
- Jorgensen, S.E.- Fundamentals of Ecological modeling. Elsevier, New York.
- P.D. Sharma- Ecology and Environment
- Dutta –Fundamentals of Ecology

EVOLUTION

- Dobzhansky, Th. Genetics and origin of Species. Colombia University Press
- Dobzhansky, Th., F.J. Ayala. G.L. Stebbens and J.M. Valentine.
- Evolution, Surjeet Publication, Delhi.
- Futuyama, D.J. Evolutionary Biology. Sinauer Associates, INS
- Publishers, Sunderland
- Jha, A.P. Genes and Evolution, John Publication, New Delhi
- King, M. Species Evolution – the role of chromosomal change.
- The Cambridge University Press, Cambridge.
- Merrel, D.J. Evolution and genetics. Oxford University Press, New
- York
- Strikberger, M.W. Evolution. Jones and Bartett Publishers,
- Boston, London.
- Moody –An introduction to evolution
- Lull organic evolution
- P.K.Gupta- Ecology, genetics and Evolution
- Savage- Evolution
- Tomer and Singh – organic evolution, Rastogi Publication, merrut

FISHERY SCIENCES-I AND II

- Fish and fisheries of India – V.G Jhingran, Hindustan pub. Cor.india.
- Tropica fish farming- D.K.Belsare, Environmental publication, karad.
- Aquaculture – J.E.Bardach, J.H. Ryther,W.O. McLarney, Wiley Inter science A science of John Wiley and sons INC, New York.
- Text book of Fish Culture – Breeding and Cultivation of Fish- Marcel Huet, Fishing News books ltd. Farhman, Survey, England.

- Fish Farming Hand Book- E.E. Brown and J.B. graatzzek. VI Pub.
- Freshwater fish pond culture and management – M. Chakroff Scientific Publisher Jodhpur.
- A text book of aquaculture-M.S. Reddy, Discovery publication house New Delhi.
- Encyclopedia of Fishes and Fisheries in India –A.K. Pandey, G.S. Sandu.Vol.IV Anmol publication ,New Delhi
- Freshwater Aquaculture- R.K.Rathi, Scientific Publisher Jodhpur.
- A Hand Book of fish farming- S.C. Agarwal, Narendra publication house, New Delhi.
- Methods of physico chemical analysis of water- Gottermanet.al.
- Induced breeding of carps – H. Choudhary and S.B.Singh.
- An introduction to fishes- S.S.Khana, central book depot. Allahabad.
- Manual of Methods in Fish Biology- S.P. Biswas, South Asian Publ. new, Delhi.
- Diseases of fish- Van Duiten Jr. Jitte book Landan.

ANIMAL CULTURE [APICULTURE]

- Beekeeping in India – klhadi and village industries board gov. of maharastra
- Techniques of bee keeping- CBR and training institute, pune.
- Invertebrate zoology –kotpal
- Anatomy of honeybee- syodross.R.E.

ANIMAL CULTURE [SERICULTURE]

- Hand book of practical sericulture-Narshiihannu and Ullal
- Agro cottage industry – sericulture – C.J.Hiware.
- Tropical sericulture – tazima
- Sericulture manuals- 1st to 4th FAO publication.
- Bulletins of CSR and IT, Mysore

BIOTECHNOLOGY I&II

- Primrose, S. B. and Twyman, R. M., -Principles of Gene Manipulation and Genomics, (7th Ed. 2006), Blackwell Publishing, West Sussex, UK
- Bernard R. and Jack- Molecular Biotechnology: Principles and application of recombinant DNA, ASM Press, Herndon, USA
- R.C.Dubey & Maheshori - Biotechnology,S.Chand Publication
- B.D.Singh- Biotechnology-Himalaya publication
- Verma &Agarwal -Genetic engineering-S.Chand Publication
- Click Molecular Biotechnology
- Mayer R.A.-Molecular biology and Biotechnology
- satyanarayana-biotechnology.-

DAIRY TECHNOLOGY I&II

- S.K.De – outline of Dairy technology
- R.P. Aneja And et.al-Indian milk products,
- P.R.Gupta – Dairy Indian yearbook.(2007)