डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद

परिपत्रक क्रमांक/एस.यु./विज्ञान/अभ्यासक्रम/७४/२०१४

या परिपत्रकाद्वारे सर्व संबंधीतांना सुचित करण्यात येते की, विज्ञान विद्याशाखेने शिफारस केल्यानुसार बी. एस्सी. / एम. एस्सी. प्रथम व द्वितीय वर्षाच्या सुधारित अभ्यासक्रमास आणि बी. एस्सी. प्रथम वर्षाच्या अभ्यासक्रमात किरकोळ बदल करण्यास विद्यापरिषदेच्या वतीने मा. कुलगुरु यांनी, त्यांना प्राप्त असलेल्या विशेष अधिकार महाराष्ट्र विद्यापीठ अधिनियम-१९९४ कलम १४(७) अन्वये मान्यता दिलेली आहे. त्या अनुषंगाने सुधारीत तयार केलेल्या अभ्यासक्रमाची प्रत या परिपत्रकासोबत आपल्या पुढील कार्यवाहीसाठी पाठविण्यात येत आहे.

[1]	B.Sc. Physics	Semester-III & IV,
[2]	B.Sc. Chemistry	Semester-III & IV,
[3]	B.Sc. Botany	Semester-III & IV,
[4]	B.Sc. Zoology with minor changes	Semester-I & II,
[5]	B.Sc. Zoology	Semester-III & IV,
[6]	B.Sc. Fisheries	Semester-III & IV,
[7]	B.Sc. Electronics (Opt.)	Semester-III & IV,
[8]	B.A./B.Sc. Mathematics	Semester-III & IV,
[9]	B.Sc. Computer Science	Semester-I & II,
[10]	B.Sc. Information Technology	Semester-I & II,
[11]	B.C.A.	Semester-I & II,
[12]	B.Sc. Computer Science(Opt.)	Semester-I & II,
[13]	B.Sc. Information Technology(Opt.)	Semester-I & II,
[14]	B.Sc. Computer Application(Opt.)	Semester-I & II,
[15]	B.Sc. Computer Maintenance(Opt.)	Semester-I & II,
[16]	B.Sc. Biotechnology (Progressively)	Semester-I to VI,
[17]	B.Sc. Biotechnology (Opt.) (Progressively)	Semester-I to IV,
[18]	B.Sc. Sericulture Technology	Semester-I & II,
[19]	B.Sc. Networking Multimedia	Semester-III & IV,
[20]	B.Sc. Bioinformatics	Semester-I & II,
[21]	B.Sc. Hardware & Networking	Semester-I & II,
[22]	B.Sc. Animation	Semester-I & II,
[23]	B.Sc. Dairy Science & Technology	Semester-III & IV,
[24]	B.Sc. Biochemistry	Semester-III & IV,
[25]	B.Sc. Analytical Chemistry	Semester-III & IV,
[26]	B.Sc. Textile & Int. Decoration with minor changes	Semester-I & II,
[27]	B.Sc. Textile & Int. Decoration	Semester-III & IV,
[28]	B.Sc. Home Science with minor changes	Semester-I & II,
[29]	B.Sc. Home Science	Semester-III & IV,
[30]	B.Sc. Agro.Chem. & Fertilizers	Semester-III & IV,

..2..

[31]	**B.Sc. Geology**	**Semester-III & IV,**
[32]	**B.A. Statistics with minor changes**	**Semester-I & II,**
[33]	**B.A. Statistics**	**Semester-III & IV,**
[34]	**B.Sc. Statistics with minor changes**	**Semester-I & II,**
[35]	**B.Sc. Statistics**	**Semester-III & IV,**
[36]	**B.Sc. Industrial Chemistry**	**Semester-III & IV,**
[37]	**B.Sc. Horticultural**	**Semester-I & II,**
[38]	**B.Sc. Dry land Agriculture**	**Semester-I & II,**
[39]	**B.Sc. Microbiology**	**Semester-III & IV,**
[40]	**M.Sc. Computer Science**	**Semester-I to IV,**
[41]	**M.Sc. Information Technology**	**Semester-I to IV.**

हा सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाचा आराखडा शैक्षणिक वर्ष २०१४-१५ करिता मर्यादित असेल व विद्यापरिषदेच्या अंतिम मान्यतेनंतर हे परिपत्रक नियमित ठेवण्याबाबत या कार्यालयाद्वारे नवीन परिपत्रक पारीत करण्यात येईल. तसेच सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाची प्रत विद्यापीठाच्या संकेतस्थळावर उपलब्ध आहे.

करिता, या परिपत्रकाची सर्व संबंधितांनी नोंद घ्यावी.

विद्यापीठ प्रांगण,
औरंगाबाद-४३१ ००४.
संदर्भ क्र.एस.यु./सा.शा./सबवि /२०१३-१४/
६५९९-७०२
दिनांक :- २७-०५-२०१४.

संचालक,
महाविद्यालये व विद्यापीठ
विकास मंडळ.

****

या परिपत्रकाची एक प्रत :-

१) **मा. परिक्षा नियंत्रक, परिक्षा विभाग,**
२) मा. प्राचार्य, सर्व संलग्नीत महाविद्यालये,
३) संचालक, युनिक यांना विनंती करण्यात येते की, सदरील अभ्यासक्रम विद्यापीठाच्या संकेतस्थंळावर उपलब्ध करुण देण्यात यावेत.
४) संचालक, ई-सुविधा केंद्र, विद्यापीठ परिसर,
५) जनसंपर्क अधिकारी, मुख्य प्रशासकीय इमारत,
६) कक्ष अधिकारी, पात्रता विभाग, मुख्य प्रशासकीय इमारत,
७) कक्ष अधिकारी, बी.ए. / बी.एस्सी./ बी.सी.एस./एम.एस्सी. विभाग, परीक्षा भवन,
८) अभिलेख विभाग, मुख्य प्रशासकीय इमारती मागे,

डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद.

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

B.Sc. First Year

Zoology [Optional]

With minor Changes

First and Second Semester

Effective from 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 Mammals)	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, unit membrane theory 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)

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**
3.	Dissection: Dissection of Leech for Digestive, Excretory & Reproductive systems. Dissection of Earthworm for Nervous System & Reproductive system	**05**
4.	Mounting of any five of the following. Sponge spicules, Gemmule, Obelia colony, Jaws of Leech. Spermatica, testes nerve ring of Earthworm, Parapodia of Nereis.	**01**
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 Vertebrate 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.

Q.1.	Long answer question.	Based on chapter 1& 2
	OR	OR
	Short Notes on:	Based on chapter 1 & 2
	a)	
	b)	
Q.2.	Long answer question.	Based on chapter 3 & 4
	OR	OR
	Short Notes on:	Based on chapter 3 & 4
	a)	
	b)	
Q.3.	Long answer question.	Based on chapter 5&6
	OR	OR
	Short Notes on:	Based on chapter 5&6
	a)	
	b)	
Q.4.	Long answer question.	Based on all chapters
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q.5.	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.

Q.1.	Long answer question.	Based on chapter 1
	OR	OR
	Short Notes on:	Based on chapter 1
	a)	
	b)	
Q.2.	Long answer question.	Based on chapter 2
	OR	OR
	Short Notes on:	Based on chapter 2
	a)	
	b)	
Q.3.	Long answer question.	Based on chapter 3
	OR	OR
	Short Notes on:	Based on chapter 3
	a)	
	b)	
Q.4.	Long answer question.	Based on all chapters
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q.5.	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

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

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1. Study of museum specimen & slides of relevant Invertebrates & Protochordata. (At least 3 from each phyla)	**03**
2. Dissections: 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.	**05**
3. Mounting of any five of the following. Mouthparts of Cockroach, Mosquito, House fly, Bed bug and Honeybee. Salivary glands of cockroach. Redula of Pila, Pedicillaria of Star fish.	**01**
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.

Q.1.	Long answer question.	Based on chapter 1
	OR	OR
	Short Notes on:	Based on chapter 1
	a)	
	b)	
Q.2.	Long answer question.	Based on chapter 2 & 3
	OR	OR
	Short Notes on:	Based on chapter 2 & 3
	a)	
	b)	
Q.3.	Long answer question.	Based on chapter 4
	OR	OR
	Short Notes on:	Based on chapter 4
	a)	
	b)	
Q.4.	Long answer question.	Based on all chapters
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q.5.	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.

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

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)

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.	**10**
Q.3.	Mounting of the given material	**05**
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**

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B. Sc. III Semester

Course Code - ZOL- 301

PAPER: VII

VERTEBRATE ZOOLOGY

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1. Agnatha:- Out line classification, general characters and affinities 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 in Amphibia
   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

GENETICS – II

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

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

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

4. Microbial Genetics: - **05**
   - Transformation.
   - Conjugation.
   - Transduction.

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

Total Periods: - 45

RECOMMENDED BOOKS
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.

GENETICS-II

- Genetics. By Verma, PS and Agarwal, VK., S. Chand and Co., New Delhi
- Principles of Genetics. By Sinnott Dunn & 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.

B.Sc. III Semester

Course Code - ZOL- 303

PAPER: IX

VERTEBRATE ZOOLOGY (Practical)

1.	Museum study of vertebrates. (At least 20).	**05**
2.	Dissection of Scoliodon / Labeo Afferent and efferent, Cranial Nerves. Brain	**03**
3.	Dissection of Rat/ Frog ; Urinogenital system, Arterial system, Venous System, Brain of Rat.	**05**
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

GENETICS – II (Practical)

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 ; Attached and free ear lobe. Colour of eye. Rolling of tongue. Blood group frequency.	**02**
	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.

Q.1.	Long answer question.	Based on chapter 1&2
	OR	OR
	Long answer question.	Based on chapter 1&2
Q.2.	Long answer question.	Based on chapter 3&4
	OR	OR
	Long answer question.	Based on chapter 3&4
Q.3.	Long answer question.	Based on chapter 5&6
	OR	OR
	Long answer question.	Based on chapter 5&6
Q.4.	Short Notes on:	Based on all chapters
	a)	
	b)	
	OR	OR
	Short Notes on:	Based on all chapters
	a)	
	b)	
Q.5.	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

GENETICS – 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.

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

B.Sc. IV Semester

Course Code - ZOL- 401

PAPER: XI

ANIMAL PHYSIOLOGY (Special Emphasis on Mammals)

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

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

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

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

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

5. 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)

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 Wrinkle's method.	**02**
9.	Typographic reading of skeletal muscle properties , heart beating in Toad / Rat. (Demo only)	**01**
10.	Histological study of following. T.S. of Kidney T.S. of Testis T.S. of Ovaries T.S. of Pancreas T.S. of Intestine	**01**
	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. pH meter, Colorimeter, Centrifuge Electrophoresis	**04**
3. Factors affecting enzymes activity temperature and pH.	**02**
4. Detection of amino acid by paper chromatography.	**01**
5. Qualitative test for organic compound. Carbohydrate. Protein. Fats.	**03**
6. Quantitative estimation of protein from animal tissue using Lawry's method.	**02**
7. Study of permanent histological slides of endocrine glands. 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	**02**
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.

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

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.

Q.1.	Long answer question. OR Long answer question.	Based on chapter Sec. A 1 & 2 OR Based on chapter Sec. A 1 & 2
Q.2.	Long answer question. OR Long answer question.	Based on chapter Sec. A 3, 4 & 5 OR Based on chapter Sec. A 3, 4 & 5
Q.3.	Long answer question. OR Long answer question.	Based on chapter Sec. B 1 to 5 OR Based on chapter Sec. B 1 to 5
Q.4.	Short Notes on: a) b) OR Short Notes on: a) b)	Based on all chapters OR Based on all chapters
Q.5.	Multiple choice questions: 1 2 3 4 5 6 7 8 9 10	Based on all chapters

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 **20**
OR
Dissect Frog / Rat …….so as to expose it's ……system

Q.2. Estimation of O_2 consumption in relation to temperature. **20**
OR
Detection of any two nitrogenous waste products from the given sample
OR
Total count of RBC/WBC from given blood sample

Q.3. Mounting of ……..scale of fish. **10**
OR
Effect of hypotonic/ isotonic/ hypertonic solution on RBC
OR
Preparation of haematin crystals from given blood sample

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 **20**
OR
Problems on sex linked inheritance/ Hardy –Weinberg's law.

Q.2. Quantitative estimation of Protein from……. Tissue **20**
OR
Detection of organic compound from given samples A&B .Report the test, observation and results.
OR
Preparation of DNA model.

Q.3. Calculates the RF values of given amino acids. **15**
(Using paper chromatography)
OR
Prepare the solutions of given percentage/normality/ molarity
(At lest two types)
OR
Detection of Barr body from epithelial cells.

Q.4. Identify the given spots and comment. **30**
(Syndroms-02. Endocrine glands-03)

Q.5. Record book **10**

Q.6. Viva-voce **05**