

RAJARSHI SHAHU (AUTONOMOUS) MAHAVIDYALAYA, LATUR.

Semester wise course structure

B.Sc. S.Y. Zoology w.e.f. the Academic Year 2015-2016

Sub: - Zoology (Semester -III)

Animal Physiology and Immunology

(Course code-U-Zoo-363)

Learning Objectives

- To make the students to understand the physiological process of animals
- To understand the importance of physiology and Immunology
- To understand concepts and different types of immunity.
- To have basic knowledge of functions of different organs and organ system
- To introduce the concepts of physiology of digestion excretion and Osmoregulation
- To introduce the concepts of physiology of respiration and circulation

Course Outcome

- Learners would understand the different physiological process of animals
 - Learners would be able to correlate the habit and habitat with nutritional, excretory and osmoregulatory structures
 - Learners would be able describe the concepts and different types of immunity.
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Unit – I

1) Digestion Physiology

- i) Intracellular and Extracellular digestion
- ii) Mechanical process in digestion
- iii) Chemical process of digestion
- iv) Absorption of food

2) Respiration physiology

- i) External and Internal respiration
- ii) Respiratory organs of man
- iii) Mechanism of respiration
- iv) O₂ and Co₂ transportation
- v) Control of respiration and Respiratory quotient

Unit –II

1) Circulation physiology

- i) Open and closed type of circulation
- ii) Circulatory organs (Heart and Blood vessels)
- iii) Typical pattern of circulation
- iv) Composition and function of blood
- v) Level of blood Cholesterol, urea and sugar.
- vi) Erythropoiesis and Its regulation
- vii) Blood pressure, ECG, Heart beat and Cardiac cycle.

Unit –III

1) Excretion physiology

- i) Mode up of Excretion
- ii) Structure of nephron (Uriferous tubule)
- iii) Physiology of Urine formation

iv) Composition of urine and Osmoregulation

2) Neurophysiology

i) Structure of Neuron

ii) Structure of Synapse and reflex action

iii) Conduction of nerve impulses and Neurotransmitter

UNIT:-IV

1) Muscle physiology

i) Structure and types of muscles and Ultra structure of skeletal muscle fibre

iv) Sliding filament theory

2) Reproductive Physiology

i) Hormonal control of testicular and ovarian functions ,menstrual cycle,

3) Immunology

i) Types of Immunity ii) The immune system

iii) Immune response (Antigen, Antibody, Humoral and cell mediated immunity)

Reference Books

- 1) A textbook of Animal Physiology – K.A. Goel and K.V. Shastri (Rastogi Pub.)
- 2) A textbook of Practical Physiology – V.G. Ranade (P.V.G. Prakashan Pune.)
- 3) Clinical Pathology and Haematology – Nanda Baheti (Kanhaiya Pub.)
- 4) Comparative animal physiology C. Ladd Prosser.
- 5) Experimental Physiology – S.C. Rastogi (Wiley Eastern Ltd. London)
- 6) Human Physiology Vander A.J., Sherman J.H. and Luciano D.S. (McGraw Hill London)
- 7) Medical laboratory Techniques – Ramni Sood, Jaypee Brothers medical Pub. Pvt. Ltd. New Delhi.
- 8) Text book of animal Physiology – A.K. Berry (Emkay Pub. Delhi)
- 9) Animal Physiology – A. Mariakuttikan N. Arumugam (Saras Publication)
- 10) Principles of animal Physiology – Wood D.W.
- 11) Physiology – Guyton and Hall
- 12) Kuby-Immunology (W.H. Freeman)
- 13) Shastri N.V. - Principles of Immunology
- 14) Lal S.S. and Kumar Sanjeev –Immunology

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Semester wise course structure

B.Sc. S.Y. Zoology w.e.f. the Academic Year 2015-2016

Sub: - Zoology (Semester -III)

Genetics (Course code-U-Zoo-364)

Learning Objectives:

1. To make the students to understand the structure and functions of gene
2. To understand the importance of Genetics
3. To have basic knowledge of mutation
4. To understand the inheritance pattern.

Course Outcome

1. Understand and apply the principles of inheritance.
 2. Understand the concept of multiple alleles, linkage and crossing over.
 3. Learner able to introduce the concept of sex determination and its types, sex
 4. Influenced and sex limited genes.
 5. Learners would understand mechanisms of sex determination.
 6. Learners would be able to correlate the disorders linked to a particular sex chromosome.
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Unit –I (Mendelian genetics and Modifications)

- i) Mendelism
- ii) Monohybrid cross and Dihybrid cross
- iii) Interaction of gene (9:3:4, 9:7, 13:3, 15:1)
- iv) Incomplete dominance.
- v) Back cross and test cross.

Unit – II (Multiple Alleles and Multiple Gene)

- i) Multiple alleles – Eg. Coat colour in Rabbit .and ABO Blood groups in Man.
- ii) Rh factor and Erythroblastosis foetalis in man.
- iii) Multiple genes - Eg. Skin colour in Man.
- iv) Linkage – definition, Types and significance
- v) Crossing over –Mechanism, Factor affecting on crossing over, and Its Significance

Unit – III (Sex determination, sex linked inheritance and Gene Mutations)

- i) Chromosomal methods of sex determination.
- ii) Bridge's ratio theory of genic balance.
- iii) Sex linked inheritance in Drosophila.
- iv) Sex linked inheritance in man – colorblindness, haemophilia, Hypertrichosis and baldness.
- v) Chromosomal Mutations – Structural and numerical mutations
- vi) Mutagenic agents
- vii) sickle cell anemia.

Unit – IV (Human genetics)

- i) Syndromes – Turner's, Klinefelter's, Down's, Cat – Cry, Patau's, and Edwards.
- ii) Inborn errors of metabolism – Phenylketonuria (PKU), Alkaptonura, Albinism.
- iii) Eugenics
- iv) Euphenics
- v) Epigenetic

Reference Books

1. Verma P.S. and V. K. Agarwal (2008) Cell biology, Genetics, molecular Biology, Evolutionary Ecology, S. Chand & Co. New Delhi
2. Singh, B. D. (2002) Biotechnology,
3. Bhamrah, H. S. and Kavita Juneja. "Molecular cell Biology", Anmol publications Pvt. Ltd.
4. Gupta, P.K. (1996) "Genetics" Rastogi Publications.
5. Ranga, M.M. "Animal Biotechnology (Agrobios), Published by Agrobios (India).
6. Rastogi, Sharma, V.N. and Anuradha Tandon (1993). "Concepts in Molecular Biology". Wiley Eastern Ltd. N. Delhi.
7. Smustad, Simmons, Jenkins (1999). "Principles of Genetics" John Wiley and sons. Inc.
8. Daniel Fairbanks, W. Ralph Anderson. "Genetics, the Continuity of Life" (1999). Brooks/Cole Publishing Company, New York.
- 9) Genetics – P.K. Gupta (Rastogi pub. Meerut)
- 10) Genetics – Verma P.S. and Agarwal V.K. (S. Chand pub. Delhi.)
- 11) Genetics – Winchester (Oxford LBH Pub.)
- 12) Genetics and Evolution – A.P. Jha (Macmillon India)
- 13) Concepts of genetics – W.S. Clug (Pearson Education ISBN)
- 14) Genetics – Strickberger (Prentice – Hall)
- 15) Principle of genetics – R.H. Tamarin (Tata Mc Graw Hill Pub. India)
- 16) Concepts of Genetics – R. L. Kotpal (Rastogi Pub.)
- 17) Genetics and Genetic Engineering – Dr. R.P. Meyyan (Saras Pub.)
- 18) Foundations of Genetics – Pai A.C. (Mc Graw Hill Pu b.)
- 19) Molecular Genetics – Gunther, S. Stent, (Macmillon)
- 20) Principles of Genetcs – Sinnott, Dunn and Dobzansky (Tata McGraw Hill Pub. Delhi).
- 21) Genetics – M.P. Arora (Himalaya).
- 22) Genetics and Evolution – N. Armugam (Saras Pub.)
- 23) Genetic – Veer Bala (Rastogi Pub.)

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Semester wise course structure

B.Sc. S.Y. Zoology w.e.f. the Academic Year 2015-2016

Sub: - Zoology (Semester -III)

Animal Physiology and Immunology (Lab.Course-III -U-Zoo-365)

PRACTICALS

Learning Objectives

- To make the students to understand the haematological and immunological techniques.
- To make the students to understand the haematological techniques conducted in laboratories including, complete blood count, blood grouping, blood films, differential count.
- To make the students to understand the process of digestion by qualitative detection of digestive enzymes.
- To make the students to understand the analytical techniques know the functional status of different organ.

Course Outcome

- Learners would understand the different physiological process of animals
 - Learners would be able to understand functional status of organ
 - Learners would be able to understand complete blood count, blood grouping, blood films, differential count.
 - Learners would understand the respiratory status of animals
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Physiology

1. Qualitative detection of digestive enzymes (protease, Amylase and Lipase) in cockroach/ Crab.
2. Detection of human salivary amylase.
3. Estimation of oxygen consumption in fish/ Crab or any other suitable aquatic animal.
4. R.B.C. Counting.
5. W.B.C. counting.
6. Differential leucocyte count of blood.
7. Estimation of Haemoglobin
8. Qualitative detection of Nitrogenous waste products (Ammonia, Urea, and Uric Acid) in birds excreta and urine of Mammals.
9. Preparation of Haematin crystals
10. Estimation of urine / serum creatinine from blood
11. Separation of protein by SDS-PAGE
12. Structure of synapse, structure of neurons (slide/ chart)

13. Types of nerves – Unipolar, Bipolar, Multipolar. (slides)
14. Quantitative estimation of Na, K, Ca and Phosphorus
15. Estimation of Cholesterol, Glucose and protein from blood.
16. Calculate the respiratory quotient
17. Determination of blood group and Rh-Factor
18. Antibody and Antigen reaction.
19. Differential leucocyte count of blood.
20. Measurement of blood pressure by sphygmomanometer. .
21. Colorimetric estimation of blood/serum cholesterol. . .
22. Determination of bilirubin in serum
23. Compulsory educational excursion tour to visit various zoological important centers.

Note Any twelve practicals for each semester.

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Semester wise course structure

.B.Sc. S.Y. Zoology w.e.f. the Academic Year 2015-2016

Sub: - Zoology (Semester -III)

Genetics

Lab.Course-IV (Course code-U-Zoo-366)

Learning Objectives:

1. To make the students to understand the Mendel's Laws of inheritance.
2. To understand the importance modification in Mendelian laws like complementary factor to Blood group.
3. To understand the problems based on sex linked inheritance.
4. To understand the chromosomal abnormalities.

Course Outcome

1. Learner will be able to do the problems based Mendel's laws.
2. Understand and apply the concept of multiple alleles, linkage and crossing over.
3. Learner able to do the problems based on sex linked inheritance and blood groups etc.
5. Learners would understand mechanisms of sex determination.
6. Learners would be able to understand the Human pedigree analysis and symbols.

PRACTICALS

1. Problems based on monohybrid and dihybrid cross (Explain with the help of plastic beads.
2. Problems on modification in ratio due to interaction of genes– complementary factors, supplementary factors, inhibitory factors, duplicate genes (explain with the help of plastic beads).
3. Problems on blood group inheritance in man.
4. Problems based on sex linked inheritance
5. Culture of Drosophila and observation of genetic characters in Drosophila (eye & wings)
6. Preparation of temporary slides of salivary gland chromosomes from chironomous larva.
7. Study of slide of sickle cell anemia.
8. Study of chromosomes abnormalities in man, Down's syndrome,
9. Klinefelter Syndrome, Turner Syndrome with the help of Photograph/ Charts/ Karyotype.
10. Drosophila culture techniques.
11. Study of phenotypic characters in Drosophila (Body colour, Wing pattern and Eye colour).
12. Buccal smear – Identification of Barr Body
13. Human pedigree analysis- Various symbols used and problems

Note Any twelve practicals for each semester.

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Semester wise course structure

B.Sc. S.Y. Zoology w.e.f. the Academic Year 2015-2016

Sub: - Zoology(Semester -IV)

Biochemistry (Course code- U-Zoo-463)

Learning Objectives:

1. To make the students to understand chemistry of life
2. To understand the importance of Biochemistry
3. To have basic knowledge of metabolism
4. To give learner insight into the structure of biomolecules, and their role in sustenance of life.

Course Outcome:

1. The learner will realize the importance of biomolecules and their clinical significance.
 2. Able to demonstrate an understanding of fundamental biochemical principles, such as the structure/function of biomolecules, metabolic pathways, and the regulation of biological/biochemical processes.
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Unit-I (Classification, and biological functions)

- i) Introduction of Biochemistry
- ii) Carbohydrates and lipids
- iii) Proteins and Amino acids

Unit-II

- i) Vitamins (Discovery, types and their functional Significance.)
 - a) Fat soluble (A, D, E, K, Q and U)
 - b) Water soluble (B-complex family and Ascorbic Acid)

Unit-III (Enzymology)

- i) Nomenclature of enzyme and chemistry of enzymes
- ii) Classification, properties of enzyme
- iii) Mechanism and factor affecting on enzyme action
- iv) Biological function of enzymes

Unit-VI (Metabolism)

- i) Metabolism of Carbohydrates
(EMP, , Krebs cycle, Glycogenesis, Glyconeogenesis, Glycogenolysis.)
- ii) Metabolism of lipid
(Beta oxidation pathway, Ketogenesis, ketolysis, ketosis)
- iii)Metabolism of protein
Urea cycle, Transamination Deamination

Reference Books

- 1) Lehninger Principles of Biochemistry
-David L. Nelson, Michael M. Cox, Macmillan
Worth Publishers.
- 2) Harper's Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, LangeMedical
Books. 25thedition.
- 3) Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand & Company.
- 4) Biochemistry-Dr. Amit Krishna De, S. Chand & Co., Ltd.
- 5) Biochemistry-Dr. Ambika Shanmugam, Published by Author.
- 6) Biomolecules-C.Kannan , MJP Publishers,Chennai-5.
- 7) Laboratory manual in Biochemistry -Jayaraman.
- 8) Biochemical methods -S.Sadasivan and Manickam.

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Semester wise course structure

B.Sc. S.Y. Zoology w.e.f. the Academic Year 2015-2016

Sub: - Zoology (Semester -IV)

Molecular Biology and Genetic Engineering (Course code- U-Zoo-464)

Objectives:

1. To make the students to understand biological tools for research
2. To understand the importance of Molecular Biology and Genetic Engineering
3. To have basic knowledge of cloning and Gene Expression

Course Outcome:

1. Students will able to use biological tools for research.
 2. Learner will able to describe the importance of Molecular Biology and Genetic Engineering.
 3. Learner will able to use vectors in cloning techniques and rDNA technology
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UNIT- I

- i) Introduction to Molecular Biology
- ii) Deoxyribonucleic acid (Structure, properties, function, and type of DNA)
- iii) Ribonucleic acid (Structure and types)
- iv) Replication and genetic code

UNIT- II

- i) Protein synthesis
- ii) Gene concept and molecular structure of gene
- iii) Types of gene and Discontinuous genes (Exons and Introns)
- iv) Gene Expression in prokaryotes (Lac operon) eukaryotes
- v) One gene one enzyme hypothesis and one polypeptide hypothesis

UNIT- III

1. Introduction to genetic engineering-Mendel's to Molecules
2. Construction of cDNA
3. Tools; - a) Enzymes: - i. lysing ii. Ligases
- iii Nucleases { Exonucleases, Endonucleases, Restriction Endonucleases enzymes }
- iv. Synthesases { DNA polymerase, Reverse transcriptase }
- b) Vectors:- Cloning vectors [plasmid -pBR322, Bacteriophage-Lambda phage, Viruses-SV40, Cosmids vectors] and Expression vectors { Shuttle vector }
4. Techniques: - a) Southern, Northern and Western blotting b) PCR (Polymerase chain reaction)

UNIT- IV

1. Gene cloning
2. Linking of desired gene with vector DNA
3. Introduction of recombinant DNA into host Cell
4. Identification of recombinant DNA
5. c-DNA libraries and Genomic libraries
6. Transgenesis and Transgenic animals [Transgenic cattle, sheep, pig and fish]
7. Animal cloning and cloned animals [Dolly sheep]
8. DNA fingerprinting

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Semester wise course structure

B.Sc. S.Y. Zoology w.e.f. the Academic Year 2015-2016

Sub: - Zoology (Semester -IV)

Biochemistry

Lab.Course-V (Course code- U-Zoo-465)

Learning Objectives:

- To make the students to understand the skills necessary to analyze chemicals and chemical reactions quantitatively and qualitatively;
- To make the students to understand the skills necessary to verify hypothesis.
- To make the students to understand skills of titrimetric, Colorimetric Iodometric analysis of vitamins, amino acid.

Course Outcome:

- Learners would understand the qualitative and quantitative analytical skill of biomolecule.
- Learners would understand skills of titrimetric ,colorimetric ,Iodometric analysis of biomolecule

EXPERIMENT INVOLVING TITRIMETRIC PROCEDURES

1. Estimation of amino acids by formal titration.
2. Estimation of ascorbic acid by titrimetric method using 2, 6-dichlorophenol indophenol.

QUALITATIVE ANALYSIS.

1 Qualitative analysis of protein ,Lipid and Carbohydrates.

COLORIMETRIC ESTIMATION

1. Estimation of Protein by Biuret method/Bradford method/Lawry
2. Estimation of amino acids by ninhydrin method
3. Isolation of glycogen from liver source and its estimation by anthrone method
4. Estimation of Lipids by Chloroform Methanol mixture
5. Estimation of DNA by DPA method.
6. Estimation of RNA by Orcinol method
7. separation of protein by Gel electrophoresis

8. Effect of pH, on activity of enzyme
9. Effect of substrate concentration on activity of enzyme
10. Effect of temperature on activity of enzyme
11. Effect of enzyme concentration on Enzyme action

Note Any twelve practicals for each semester.

Reference Books

1. Molecular Biology –David Friefelder –Narosa Publishing House, New Delhi.
2. Cell Biology, Genetics, Molecular Biology, Evolution & Ecology –Verma, Agarwal –S. Chand & Co.
3. Molecular & Cell Biology –Bhamrah –Anmol Publ. Pvt. Ltd., New Delhi.
4. Molecular Biology of the Cell –Alberts, Bray, Lewis, Raff, Roberts, Watson –Garland Publishers, New York.
5. Molecular Biology of the gene –J. D. Watson, NH Hopkins, Roberts, Stertz, Weiner-Freeman.
6. Concepts in Biotechnology –Editors-Balasubramanian, Bryee, Dharmalingam, Green, Jayraman –Sangam Books.
7. Molecular Biology of the Gene –Watson, Hopkins, Roberts, Steitz, Weiner –Benjamin Cummings Publishing Co.
8. Molecular Cell Biology –Baltimore, Zipursky, Matsudaria, Darnel –W. H. Freeman & Co., New York.
9. Outlines of Biochemistry –Conn & Stumpf.
10. Principles of Biochemistry –White, Handler, Smith –McGraw Hill Publ.
11. Cell & Molecular Biology –Phillip Sheller –Wiley Publ.
12. Molecular Biology -Robert F. Wiver

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Semester wise course structure

B.Sc. S.Y. Zoology w.e.f. the Academic Year 2015-2016

Sub: - Zoology (Semester -IV)

Molecular Biology and Genetic Engineering

Lab.Course-VI (Course code-U-Zoo- U-Zoo-466)

Objectives:

1. To make the students to understand knowledge restriction digestion and r-DNA.
2. To understand the applications of Molecular Biology and Genetic Engineering
3. To have basic knowledge of cloning and Gene Expression, gene transfer, Blotting techniques, Equipments used in genetic etc.

Course Outcome:

1. Learners will able to understand the blotting technique.
 2. Learner will be able to use the agarose gel electrophoresis for DNA molecular size determination and will be able to estimate the DNA and RNA.
 3. Learner will able to understand the vectors in cloning techniques and rDNA technology
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PRACTICALS

1. Genomic DNA extraction
2. Genomic RNA extraction
3. Demonstration of restriction digestion
4. Ligation
5. Plasmid preparation
6. DNA molecular size determination
7. **PCR Application:** Single Nucleotide Polymorphism (SNP)
8. Demonstration of genomic DNA.
9. Demonstration of Southern / western blotting.
10. Estimation of DNA by DPA method.
11. Estimation of RNA by Orcinol method
12. Study of Vectors used in rDNA Technology
13. Study of equipment used in rDNA Technology
14. Excursion/Compulsary visit to a search centre

Note Any twelve practicals for each semester.



**Rajarshi Shahu Mahavidyalaya, Latur.
(Autonomous)**

**Syllabus
B.Sc. Second Year
ZOOLOGY
(Revised)**

**(Third and Fourth Semester)
Semester Pattern
W.e.f. 2015-16**

RAJARSHI SHAHU MAHAVIDYALAYA, LATUR.
Semester wise course structure
B.Sc.S.Y. Zoology w.e.f. the Academic Year 2014-2015
DEPARTMENT OF ZOOLOGY

SYLLABUS

Sr.No.	Semesters	Course Title	Course code	Marks	Periods
1	III	Animal Physiology and Immunology	U-Zoo-258	50	45
		Genetics	U-Zoo-258	50	45
		Lab.Course-III	U-Zoo-258	50	45
		Lab.Course-IV	U-Zoo-258	50	45
2	IV	Biochemistry	U-Zoo-463	50	45
		Molecular Biology and Genetic Engineering	U-Zoo-464	50	45
		Lab.Course-V	U-Zoo-465	50	45
		Lab.Course-VI	U-Zoo-466	50	45