

**Swami Ramanand Teerth Marathwada University,  
Nanded.**



**B.Sc. Second Year  
Zoology**

**Semester Pattern Syllabus  
w.e.f. June 2014**

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,  
NANDED VISHNUPURI, NANDED (M.S.)**

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**Board of Studies in Zoology**

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## **INTRODUCTION - ZOOLOGY CURRICULA**

Revising and updating of the curricula is the continuous process to provide an updated education to the students at large. To ensure and have uniform curricula at U.G. and P.G Levels in different Indian Universities, U.G.C developed a model curriculum and forwarded the same all the universities in the country to serve as a base in updating their respective curricula.

The curriculum designing committee of SRTMU Nanded was constituted for zoology at UG and PG levels which consisted all the members of B.O.S. The members are specialist and experts in different areas of zoology.

For developing the final draft of curriculum, the committee took into account the U.G.C Suggestions regarding model curriculum, total number of teaching days available in the year and guidelines given by faculty of science of SRTMU Nanded. The curriculum designing committee held a couple of meetings in which there were thorough and critical suggestions on the concern syllabi. After making appropriate corrections and changes, the committee accepted the final draft of syllabus.

The SRTMU Nanded is having B.Sc and M.Sc. Zoology courses designed with semester system pattern. The course content of each theory paper is divided into four units, each having number of topics and subtopics with appropriate titles and subtitles. For each topic, total number of periods required and weightage of marks is mentioned. At the end of each theory paper the list of selected reading material is provided. A list of practical exercise to be completed in the academic year is also given, paperwise question paper models are provided in the syllabus.

### **Objectives**

- 1.) To update curricula by introducing recent advances in the subject and enable the students to face NET , SET and other competitive examination successfully.
- 2.) To create awareness among students about the latest streams of life sciences including biotechnology, tissue culture, genetic engineering.
- 3.) To improve the quality of laboratory and field work for which zoological study tours and excursions have been made compulsory so that the students can become familiar with reality of ecosystem and surrounding study.
- 4.) To prepare students to attract and develop interest in physiology , genetics , cell biology, fisheries science, toxicology so that the students can select zoology as their carrier.

**Board of Studies  
Zoology  
S.R.T.M.U NANDED**

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**B.SC. SECOND YEAR SYLLABUS 2014  
ZOOLOGY SEMESTER III  
Paper - VI  
GENETICS**

**Marks:-40+10**

**Periods: 45**

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**Unit – I**

**11**

**1) Introduction to Genetics**

**2) Mendelism**

- i) Mendel's Laws of inheritance
- ii) Monohybrid, dihybrid cross and ratio.
- iii) Incomplete dominance.
- iv) Back cross and test cross.

**3) Interaction of genes**

- i) Complementary factor (9:7)
- ii) Supplementary factor (9:3:4)
- iii) Inhibitory factor (13:3)
- iv) Duplicate genes (15:1)
- v) Lethal genes (1:2:1)

**Unit – II**

**11**

**1) Multiple Alleles and Genes**

- i) Inheritance of ABO Blood groups in Man.
- ii) Rh factor and Erythroblastosis foetalis in man.
- iii) Multiple genes – skin pigmentation in man.

**2) Linkage and Crossing over**

- i) Linkage – definition, types and significance
- ii) Crossing over –
  - Mechanism of crossing over,
  - Factor affecting crossing over,
  - Significance of crossing over.

## **Unit – III**

12

### **1) Sex determination**

- i) Chromosomal methods of sex determination.
- ii) Bridge's ratio theory of genic balance.

### **2) Sex linked inheritance**

- i) Sex linked inheritance in *Drosophila*.
- ii) Sex linked inheritance in man – colourblindness, haemophilia, Hypertrichosis

### **3) Cytoplasmic Inheritance-Ex. Kappa Particles (Paramecium)**

### **4) Mutation**

- i) Chromosomal mutations – Structural alterations & Numerical alteration (Polyploidy).
- ii) Gene mutations – Sickle Cell Anaemia.
- iii) Mutagenic agents.

## **Unit – IV**

11

### **1) Human Genetics**

- i) Syndromes – *Turner, Klinefelter, Down, Cat – Cry, patus*.
- ii) Inborn errors of metabolism – Phenylketonuria (PKU), Alkaptonura, Albinism.
- iii) Human pedigree analysis with symbols.

### **2) Nature and functions of genetic materials.**

- i) DNA – structure, functions and replications
- ii) RNA – Structure, types and functions.
- iii) Genetic code

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**B.SC. SECOND YEAR SYLLABUS 2014  
ZOOLOGY SEMESTER III  
PAPER - VII  
COMPARATIVE ANATOMY AND PHYSIOLOGY**

**Marks:-40+10**

**Periods: 45**

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**Unit –I**

**1) Comparative Anatomy of Vertebrates 11**

- i) Integument
- ii) Heart
- iii) Kidney

**Unit –II 11**

**1) Enzymes**

- i) Nature and Classification of enzymes.
- ii) Mechanism of enzyme action.
- iii) Factors affecting on enzymes activity.

**2) Nutrition**

- i) Digestion of carbohydrates, proteins and lipids.
- ii) Vitamins – Fat soluble and Water soluble vitamins  
(Sources, deficiency diseases and effects)

**Unit –III 11**

**1) Respiration**

- i) Definition of Aquatic and Aerial respiration.
- ii) Respiratory organs in man.
- iii) Mechanism of respiration.
- iv) Transport of O<sub>2</sub> and CO<sub>2</sub>

**2) Circulation**

- i) Blood – composition and functions.
- ii) Structure and working of heart.
- iii) E.C.G. and Blood Pressure.
- iv) Blood clotting.

**1) Excretion**

- i) Modes of excretion in animals (Ammonotelism, Ureotelism and Uricotelism )
- ii) Structure of kidney (V.S.)
- iii) Structure of uriniferous tubules.
- iv) Physiology of urine formation.
- v) Composition of urine.

**2) Nerve Physiology**

- i) Structure and types of neurons.
- ii) Structure of synapse.
- iii) Conduction of nerve impulse.

**3) Muscle Physiology**

- i) Types of muscles- smooth muscles, skeletal muscles and cardiac muscles.
- ii) Ultra structure of skeletal muscles.



## REFERENCES BOOKS

### (Anatomy)

1. Comparative anatomy of vertebrates – Kent C. G.
2. Outlines of comparative Anatomy of Vertebrates – Kingsley C. G. (Central Book Depot Allahabad)
3. An Introduction of Vertebrates Anatomy – Messers H. M.
4. Comparative Anatomy – Montagna W., John Wiley and Sons Inc.

### (Physiology)

1. Eckert R. Animal Physiology (W. H. Freeman)
2. A Textbook of Animal Physiology – K. A. Goel and K. V. Shastri (Rastogi Pub.)
3. A Textbook of Practical Physiology – V.G. Ranade (P. V. G. Prakashan Pune.)
4. Animal Physiology – A. Maria Kyttikan and N. Arumugam (Saras Pub.)
5. Biochemistry – Arumugam et.al, (Saras Pub.)
6. Clinical Pathology and Haematology – Nanda Baheti (Kanhaiya Pub.)
7. Comparative Animal Physiology C. Ladd Prosser.
8. Experimental Physiology – S. C. Rastogi (Wiley Eastern Ltd. London)
9. Human Physiology Vander A. J., Sherman J. H. and Luciano D. S.(McGraw Hill London)
10. Medical Laboratory Techniques – Ramni Sood, Jaypee Brothers medical Pub. Pvt. Ltd. New Delhi.
11. Principles of Anatomy and Physiology – Tortora G. H. and Grabowasky S. R. (Harper Collins College Pub.)
12. Text book of Animal Physiology – A. K. Berry (Emkay Pub. Delhi)
13. Principles of Animal Physiology – Wood D. W.
14. Physiology – Guyton and Hall

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**B.SC. SECOND YEAR SYLLABUS 2014  
ZOOLOGY SEMESTER IV  
PAPER - VIII  
GENETIC ENGINEERING AND EVOLUTION**

**Marks:-40+10**

**Periods: 45**

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**UNIT - I** **12**

**1) Introduction of Genetic Engineering**

**2) Recombinant DNA Technology**

- i) Tools: - A) Enzymes: -
  - a) Lysing
  - b) Ligases
  - c) Nucleases (Exonucleases, Endonucleases, Restriction Endonucleases)
  - d) Synthetases (DNA polymerase, Reverse transcriptase)
- B) Vectors: - Cloning vectors  
(Plasmid -psBR322, Bacteriophage-Lambda phage,  
Virus-SV40, Cosmid vectors)

**3) Techniques: -**

- i) Gel-Electrophoresis
- ii) PCR (Polymerase Chain Reaction)
- iii) Southern, Northern and Western Blotting.

**UNIT- II** **11**

- 1) Construction of rDNA
- 2) c-DNA libraries and Genomic libraries
- 3) Transgenesis and Transgenic animals (Transgenic cattle, sheep, pig and fish)
- 4) Cloning and cloned animals (Dolly sheep)
- 5) DNA fingerprinting.

**UNIT- III** **11**

**1) Concept of Evolution**

**2) Theories of organic evolution**

- i) Lamarck's theory
- ii) Darwin's theory
- iii) Modern synthetic theory-Neo-Darwinism
- iv) Hugo De Vries theory

## UNIT- IV

11

- 1) Evidences of organic evolution
  - a) Anatomical
  - b) Embryological
  - c) Paleontological
  - d) Biochemical
- 2) Adaptations:-Aquatic, Terrestrial, Fossorial, Volant and Desert.
- 3) Hardy-Weinberg's law

## REFERENCES BOOKS

- 1) Genetics – P.K. Gupta (Rastogi Pub. Meerut)
- 2) Genetics – Verma P.S. and Agarwal V.K. (S. Chand Pub. Delhi.)
- 3) Cytology, Genetics and Evolution – P.K. Gupta (Rastogi Pub. Delhi)
- 4) Elementary Genetics – Single tone
- 5) Genetics – Winchester (Oxford LBH Pub.)
- 6) Genetics and Evolution – A.P. Jha (Macmillon India)
- 7) Concepts of Genetics – W.S. Clug (Pearson Education ISBN)
- 8) Genetics – Strickberger (Prentice – Hall)
- 9) Principle of Genetics – R.H. Tamarin (Tata Mc Graw Hill Pub. India)
- 10) Concepts of Genetics – R. L. Kotpal (Rastogi Pub.)
- 11) Genetics and Genetic Engineering – Dr. R.P. Meyyan (Saras Pub.)
- 12) Foundations of Genetics – Pai A.C. (Mc Graw Hill Pub.)
- 13) Molecular Genetics – Gunther, S. Stent, (Macmillon)
- 14) Principles of Genetics – Sinnott, Dunn and Dobzansky (Tata McGraw Hill Pub. Delhi).
- 15) Genetic – Sarin C. (Tata McGraw Hill Pub. Delhi)
- 16) Organic Evolution – M.P. Arora (Himalaya Pub. House)
- 17) Evolution – M.W. Strickberger (CB Publishers)
- 18) Organic Evolution – N. Armugam (Saras Pub.)
- 19) Principles of Gene Manipulation and Introduction of Genetic Engineering  
– R. W. Old and S. B. Primerose.
- 20) Text Book of Genetics – H. S. Bhamrah (Amol Pub. New Delhi.)
- 21) Genetics – M. P. Arora (Himalaya).
- 22) Genetics and Evolution – N. Armugam (Saras Pub.)
- 23) Genetic – Veer Bala (Rastogi Pub.)
- 24) Evolution – Moody
- 25) Evolution – Gopalkrishnan
- 26) Cytology and genetics – Dyansagar V. R. (Tata McGraw Hill Pub. 1992 Reprint)
- 27) Organic evolution – Harjendra Singh and C. M. Chaturvedi (Amul Pub.)
- 28) Manual of Practical Zoology – P. K. G. Nair and K. P. Achar (Himalaya Pub.)
- 29) Echert R. Animal Physiology (W.H. Freeman)
- 30) A textbook of Animal Physiology – K.A. Goel and K.V. Shastri (Rastogi Pub.)
- 31) A Textbook of Practical Physiology – V. G. Ranade (P. V. G. Prakashan Pune.)
- 32) Animal Physiology – A. Maria Kyttikan and N. Armugam (Saras Pub.)
- 33) Biochemistry – Arumugam et.al, (Saras Pub.)
- 34) Clinical Pathology and Haematology – Nanda Baheti (Kanhaiya Pub.)
- 35) Comparative Animal Physiology C. Ladd Prosser.
- 36) Experimental Physiology – S. C. Rastogi (Wiley Eastern Ltd. London)
- 37) Human Physiology Vander A. J., Sherman J.H. and Luciano D.S. (McGraw Hill London)
- 38) Medical laboratory Techniques – Ramni Sood,  
(Jaypee Brothers Medical Pub. Pvt. Ltd. New Delhi).
- 39) Principles of Anatomy and Physiology – Tortora G. H. and Grabowasky S. R.  
(Harper Collins college Pub.)
- 40) Text book of Animal Physiology – A. K. Berry (Emkay Pub. Delhi)
- 41) Principles of Animal Physiology – Wood D. W.

- 42) Physiology – Guyton and Hall
- 43) Bailey's Textbook of Histology – Williams and Wilkins (Baltimore and Scientific book Agency, Culcutta Copenhagen W. M.)
- 44) Text book of Histology – Bloom W. and Fawcett D. W.
- 45) Histology of Mammals – Athavale M. V. and latey A. N.
- 46) Histology – Lippinocott, Han A.W.
- 47) Human Histology – Leslie Brainerd Arey (Khosla Pub. House, Delhi)
- 48) Comparative anatomy of vertebrates – Kent C.G.
- 49) Outlines of comparative Anatomy of Vertebrates – Kingsley C. G.  
(Central Book Depot Allahabad)
- 50) An Introduction of Vertebrates Anatomy – Messers H.M.
- 51) Comparative Anatomy – Montagna W., John Wiley and Sons Inc.
- 52) Tools of Biochemistry – T. G. Cooper.
- 53) Biochemistry – C. B. Power (Himalaya Pub.)
- 54) Outline of Biochemistry – Conn. E.E. and Stumpf P. V.
- 55) Biochemistry – Leninger A. L.
- 56) Biochemistry – Das.
- 57) Textbook of Biochemistry – Rao K. R.
- 58) Textbook of Biochemistry West E. S., Todd W. R. Mason H. S. and Van Bruggen J. T.

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**B.SC. SECOND YEAR SYLLABUS 2014  
ZOOLOGY SEMESTER IV  
PAPER - IX  
ENDOCRINOLOGY, HISTOLOGY AND BIOCHEMISTRY**

**Marks:-40+10**

**Periods: 45**

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<b>Unit – I</b>	<b>11</b>
<b>1) Endocrinology</b>	
i) Pituitary gland	
ii) Thyroid gland	
iii) Adrenal gland	
iv) Islet's of Langerhans (Pancreas)	
v) Menstrual Cycle.	
<b>Unit – II</b>	<b>12</b>
<b>1) Histology of mammalian organs and tissues.</b>	
i) Stomach   ii) Intestine   iii) Pancreas   iv) Liver	
v) Kidney   vi) Testes   vii) Ovary.	
<b>Unit – III</b>	<b>11</b>
<b>1) Carbohydrate metabolism:</b>	
i) Glycogenesis, Glycogenolysis and Gluconeogenesis	
ii) Glycolysis	
iii) Krebs's cycle	
<b>Unit – IV</b>	<b>11</b>
<b>1) Protein metabolism :</b>	
i) Deamination and Transamination	
ii) Ornithine cycle.	
<b>2) Lipid metabolism :</b>	
i) B-Oxidation	
ii) Ketosis, Ketogenesis and Ketolysis.	

## REFERENCES BOOKS

### (Endocrinology)

1. Williams Text Book of Endocrinology – Tenth Edition, Saunders, 2003.
2. Endocrinology – Mac E. Hadley, Fifth Edition, Pearson Education, 2004.
3. Molecular Endocrinology – Bolander, F.F., Academic, San-Diego, 1989.
4. Textbook of Endocrinology – Griffin J.E., S.R. Ojeda, Oxford, New York, 1988.
5. Basic and Clinical Endocrinology – Greenspan, F.S., 3rd Edi., Appleton and Lange.
6. Basic Medical Endocrinology – Goodman, H.M., Raven, New York, 1988.
7. Hormones : From Molecules to Disease, Bailiene, E.E. & P.A. Kelly, Herman, NewYork, 1991.

### (Histology)

1. Bailey's Textbook of Histology – Williams and Wilkins Baltimore and Scientific Book Agency, Culcutta Copenhagen W. M.
2. Text book of Histology – Bloom W. and Fawcett D. W.
3. Histology of Mammals – Athavale M. V. and latey A. N.
4. Histology – Lippincott, Han A. W.
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**B.SC. SECOND YEAR SYLLABUS 2014  
PRACTICAL PAPER – X  
BASED ON PAPER – VI AND VIII  
GENETICS, GENETIC ENGINEERING AND EVOLUTION**

**Practicals: 28**

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1. Problems based on Monohybrid and Dihybrid cross.
2. Problems based on interaction of genes (Complementary, Supplementary, Inhibitory Duplicate factors)
3. Problems based on blood group inheritance in man.
4. Problems based on sex linked inheritance.
5. Culture of *Drosophila* and its observation of genetic characters like eyes and wings.
6. Preparation of temporary slides of salivary gland chromosomes from chironomid larva.
7. Study of permanent slide of sickle cell anaemia.
8. Study of chromosomal abnormalities in man with the help of photographs/charts and Karyotypes
  - a) Down's syndrome
  - b) Klinefelter's syndrome
  - c) Turner's syndrome
9. Human pedigree analysis- various symbols used.
10. Estimation of DNA by Diphenyl amine (DPA method)
11. Study of human genetic traits (Rolling tongue, Length of index and ring finger, ear lobes) by using Hardy Weinberg's principle.
12. Calculation of frequencies of recessive and dominant gene in a population by using Hardy Weinberg Principle.
13. Calculation of heterozygote and homozygote in population by using Hardy Weinberg's principle.
14. Study of evidences by using photograph/charts and models
  - a) Analogous and Homologous organs
  - b) Connecting link (*Peripatus* and *Archaeopteryx*)
  - c) Embryological evidences
15. Study of adaptations (Museum Specimens).

**Note: Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.**



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**B.SC. SECOND YEAR SYLLABUS 2014  
PRACTICAL QUESTION PAPER PATTERN – X  
GENETICS, GENETIC ENGINEERING AND EVOLUTION  
QUESTION PAPER PATTERN (X)**

**Time- 4 Hours**

**Maximum Marks- 50**

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- Q.1 Solve one problem from monohybrid cross and one problem from dihybrid cross. (05)
- Q.2 Solve one problem based on blood group inheritance. (05)
- OR**
- Solve any one problem based on sex-linked inheritance.
- Q.3 Solve any two problems on Interaction of genes.  
(Complementary, Supplementary, Inhibitory Factors, Duplicate genes.) (10)
- Q.4 Identification of human syndromes (any two) (05)
- OR**
- Preparation of temporary mount of salivary gland chromosomes of chironomous larvae.
- OR**
- Observation of genetic characters of Drosophila.
- Q.5 Identify and Comments on as per instructions. (05)
- a) Humans pedigree analysis (Any five symbols)
- b) Sickle cell anaemia –slide/photograph/ charts.
- OR**
- Problems based on Hardy- Weinberg Principle for the calculation of .....
- OR**
- Estimation of DNA by DPA Method.
- Q.6 Identify and comments on as per the instructions. (10)
- a) Adaptations (any two) Aquatic, Terrestrial, Aerial/ Volant, Fossorial, Desert
- b) Evidence (any two) Analogous and Homologous organs, Connecting links, Embryological evidence
- Q.7 Submission of Record Book and Viva- Voce (10)

**Note: Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.**

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**B.SC. SECOND YEAR SYLLABUS 2014  
PRACTICAL PAPER – XI  
BASED ON PAPER VII AND IX  
COMPARATIVE ANATOMY AND PHYSIOLOGY,  
ENDOCRINOLOGY, HISTOLOGY AND BIOCHEMISTRY**

**Practicals: 28**

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- 1) Qualitative detection of digestive enzymes (Protease, Amylase and Lipase) in cockroach.
- 2) Detection of human salivary amylase.
- 3) Estimation of oxygen consumption in fish or any other suitable aquatic animal.
- 4) R.B.C. counting.
- 5) W.B.C. counting.
- 6) Estimation of Haemoglobin.
- 7) Detection of blood groups.
- 8) Measurement of B.P. by using B.P. apparatus (Demonstration only).
- 9) Qualitative detection of nitrogenous waste products (Ammonia, Urea, Uric acid) in bird's excreta and urine of Mammals.
- 10) Preparation of Haematin crystals.
- 11) Temporary preparation of squamous epithelium, ciliated epithelium, skeletal muscle fiber and blood smear.
- 12) Study of histological structure of following organs – stomach, intestine, pancreas, liver, kidney, testis, ovary, thyroid and pituitary.
- 13) Structure of synapse, structure of neurons (slide/chart)
- 14) Types of nerve cells - Unipolar, Biopolar, Multipolar (Slides)
- 15) Location of endocrine glands through charts or models.
- 16) Preparation of block.
- 17) Compulsory educational excursion tour to visit various zoological important centers.
- 18) Note: Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.**

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**B.SC. SECOND YEAR SYLLABUS 2014  
PRACTICAL QUESTION PAPER PATTERN – XI  
BASED ON PAPER VII AND IX  
COMPARATIVE ANATOMY AND PHYSIOLOGY,  
ENDOCRINOLOGY, HISTOLOGY AND BIOCHEMISTRY**

**Time-4 hrs**

**Maximum Marks -50**

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Q.1) Qualitative detection of digestive enzymes (Protease, Amylase and Lipase) (10)  
in Cockroach

**OR**

Detection of human salivary amylase

Q.2) Estimation of O<sub>2</sub> consumption in fish or any suitable aquatic animal (10)

**OR**

Detect any two nitrogenous waste products.

Q.3) Estimate the haemoglobin percentage in a given sample of blood (05)

**OR**

Measurement of blood pressure in Man

Q.4) Counting of R.B.C. / W.B.C. in blood sample provided (05)

**OR**

Prepare haematin crystals from blood sample provided

**OR**

Detection of blood groups from given sample

Q.5) Identify any two endocrine glands in charts/ models provided (05)

**OR**

Preparation of block from given tissue

Q.6) Identify and describe the two histological slides (05)

Q.7) Viva-voce, and excursion report (05)

Q.8) Record book (05)

**Note: Demonstration of animal Dissections through Models, Charts and Computer Aided Techniques as per U.G.C Guidelines.**