

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

**B.Sc. Second Year
Zoology**

Semester Pattern Syllabus

w.e.f. June 2010

S.R.T.M.U. Nanded
B.Sc. Second Year Syllabus 2010

Zoology
Semester III
Paper VI
GENETICS

Periods: 45

Unit – I

1) Mendelism

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

II) Interaction of genes

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

Unit – II

I) 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.

II) 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

I) Sex determination and sex linked inheritance

A) Sex determination

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

B) Sex linked inheritance

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

II) Mutation

- i) Chromosomal mutations – structural alterations. & Numerical alteration (Polyploidy).
- ii) Gene mutations – sickle cell anaemia.
- iii) Mutagenic agents.

Unit – IV

I) Human Genetics

- i) Syndromes – Turner's, Klinefilter's, Down's, Cat – Cry, Patu's, and Edwards.
- ii) Inborn errors of metabolism – Phenylketonuria (PKU), Alkaptonura, Albinism.
- iii) Human pedigree analysis with symbols used.

II) Nature and functions of genetic materials.

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

Semester III - Paver VII
(Comparative Anatomy and Physiology)

Periods: 45

Unit – I

1) Comparative Anatomy of vertebrates

- i) Integument
- ii) Heart and aortic arches
- iii) Kidney
- iv) Brain

Unit – II

1) Enzymes

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

2) Nutrition

- i) Physiology of proteins, carbohydrates and lipids digestion and absorption of digested food.
- ii) Vitamins – Fat soluble and water soluble vitamins, sources, deficiency diseases and effects of fat soluble and water soluble vitamins.

Unit – III

1) Respiration

- i) Types of Respiration (Aquatic and Aerial)
- ii) Respiratory organs in Man.
- iii) Mechanism of Respiration and transport of O₂ and CO₂
- iv) Smoking and its physiological effects.
- v) Respiratory quotient.

2) Circulation

- i. Structure and working of heart
- ii. Composition and functions of blood
- iii. E.C.G. and Blood pressure.
- iv. Blood clotting – Intrinsic and Extrinsic factors.

Unit – IV

1) Excretion

- i. Structure of kidney (V.S.) and Uriniferous tubules.
- ii. Physiology of urine formation.
- iii. Composition of Urine

2) Nerve physiology

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

3) Muscle physiology

- i) Types of muscles – skeletal muscles, cardiac muscles, smooth muscles.
- ii) Ultra structure of skeletal muscle.
- iii) Sliding filament theory of muscle contraction.

Semester IV
Paper VIII
Genetic Engineering and Evolution

Periods: 45

Unit – I

1) Recombinant DNA technology

- i) Principles
- ii) Tools a) Restriction enzymes b) Cloning vectors
- c) Competent host d) cDNA library e) Genomic library
- iii) Techniques a) Southern blotting b) Northern blotting

Unit – II

- 1) Transgenesis and transgenic animals.
- 2) Cloning in animals.
- 3) DNA fingerprinting.
- 4) Human genome and human genome project.

Unit – III

- i) Theories of origin of life.
- ii) Theories of organic evolution,
 - a) Lamark's, theory
 - b) Darwin's, theory and Neodarwinism
 - c) De Varie's theory

Unit – IV

- 1) Evidences of organic evolution
 - 1) Anatomical 2) Paleontological 3) Embryological
- 2) Adaptations – Aquatic, Terrestrial, Fossorial, Volant and Desert
- 3) Hardy – Weinberg's law.
- 4) Evolution of man.

Semester IV
Part IX
(Endocrinology, Histology and Biochemistry)

Periods : 45

Unit - I

1) Endocrinology

- i. Pituitary gland
- ii. Thyroid gland
- iii. Adrenal gland
- iv. Islet's of langerhan's
- v. Male and female sex hormones.
- vi. Menstrual cycle.

Unit – II

1) Histology of mammalian organs and tissues.

Stomach, Intestine, Pancreas, Liver, Kidney, Testes, Ovary, Thyroid gland, Pituitary gland and Adrenal gland.

Unit – III

1) Carbohydrate metabolism:

- i) Glycogenesis, Glycogenolysis and Gluconeogenesis
- ii) Glycolysis
- iii) Krebs's cycle

Unit - IV

1) Protein metabolism:

- i) Deamination and Transamination
- ii) Ornithine cycle.

2) Lipid metabolism:

- i) B-Oxidation
- ii) Ketosis, Ketogenesis and Ketolysis.

Zoology Practical Paper X
Genetics, Genetics engineering and Evolution
Based on Paper VI and VIII
Syllabus

Practicals: 28

- 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, Klinefelter Syndrome, Turner Syndrome with the help of Photograph/ Charts/ Karyotype.
- 9) Human pedigree analysis – various symbols used and problems.
- 10) Study of blotting techniques for the separation of DNA and mRNA
- 11) Study of human genetic traits and application of Hardy – Weinberg principle – Baldness, length of index and ring finger, attached and free ear lobes, rolling tongue.
Calculation of frequencies of recessive and dominant genes in a population.
Calculation of Hetrozygotes and Homozygotes in a population.
- 12) Study of evidences.
 - i) Analogous and Homologous organs.
 - ii) Connecting links (*Peripatus*, *Archropteryx*)
 - iii) Embryological evidences
- 13) Study of adaptations (Museum specimens)

- i) Aquatic
- ii) Terrestrial
- iii) Volent
- iv) Fossorial
- v) Desert

B.Sc. II (Zoology)
Paper XI (Practical)
Based on Paper VII and IX

Practicals: 28

- 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) Estimation of Haemoglobin.
- 7) Detection of blood groups.
- 8) Qualitative detection of Nitrogenous waste products (Ammonia, Urea, Uric acid) in birds excreta and urine of Mammals.
- 9) Preparation of Haematin crystals.
- 10) Temporary preparation of squamous epithelium, ciliated epithelium, skeletal muscle fiber and blood smear.
- 11) Study of histological structure of following organs – Stomach, intestine, pancreas, liver, kidney, testis, ovary, thyroid and pituitary.
- 12) Structure of synapse, structure of neurons (slide/ chart)
- 13) Types of nerves – Unipolar, Bipolar, Multipolar. (slides)
- 14) Location of endocrine glands through dissection, charts or models.
- 15) Preparation of histological permanent slides by the process of block preparation, section cutting and staining.
- 16) Compulsory educational excursion tour to visit various zoological important centers.

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 Genetcs – 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.)
manual of practical zoology – P.K.G. Nair and K.P.Achar (Himalaya Pub.)

- 28) Echert R. Animal Physiology (W.H. Freeman)
- 29) A textbook of Animal Physiology – K.A. Goel and K.V. Shastri (Rastogi Pub.)
- 30) A textbook of Practical Physiology – V.G. Ranade (P.V.G. Prakashan Pune.)
- 31) Animal Physiology – A.Maria Kyttikan and N.Arumugam (Saras Pub.)
- 32) Biochemistry – Arumugam et.al., (Saras Pub.)
- 33) Clinical Pathology and Haematology – Nanda Baheti (Kanhaiya Pub.)
- 34) Comparative animal physiology C. Ladd Prosser.
- 35) Experimental Physiology – S.C. Rastogi (Wiley Eastern Ltd. London)
- 36) Human Physiology Vander A.J., Sherman J.H. and Luciano D.S. (McGraw Hill London)
- 37) Medical laboratory Techniques – Ramni Sood, Jaypee Brothers medical Pub. Pvt. Ltd. New Delhi.
- 38) Principles of anatomy and Physiology – Tortora G.H. and Grabowasky S.R. (Harper Collins college Pub.)
- 39) Text book of animal Physiology – A.K. Berry (Emkay Pub. Delhi)
- 40) Principles of animal Physiology – Wood D.W.
- 41) Physiology – Guyton and Hall
- 42) Bailey's Text book of Histology – Williams and Wilkins Baltimore and Scientific book Agency, Culcutta Copenhaver W.M.
- 43) Text book of Histology – Bloom W. and Fawcett D.W.
- 44) Histology of mammals – Athavale M.V. and latey A.N.
- 45) Histology – Lippinocott, Han A.W.
- 46) Human Histology – Leslie Brainerd Arey (Khosla Pub. House, Delhi)
- 47) Comparative anatomy of vertebrates – Kent C.G.
- 48) Outlines of comparative Anatomy of Vertebrates – Kingsley C.G. (Central Book Depot Allahabad)
- 49) An introduction of Vertebrates Anatomy – Messers H.M.
- 50) Comparative Anatomy – Montagna W., John Wiley and Sons Inc.
- 51) Tools of Biochemistry – T.G. Cooper.

- 52) Biochemistry – C.B. Power (Himalaya Pub.)
- 53) Outline of Biochemistry – Conn. E.E. and Stumpf P.V.
- 54) Biochemistry – Leninger A.L.
- 55) Biochemistry – Das.
- 56) Text book of Biochemistry – Rao K.R.
- 57) Text book of Biochemistry West E.S., Todd W.R. Mason H.S. and Van
Bruggen J.T.

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Faculty of Science
B.Sc. Second Year

Sub:- Zoology (Genetics, Genetic Engineering and Evolution)
Question Paper Pattern (X)

Time- 4 Hours

Max. M. 100

Q.1 Solve one problem from monohybrid cross and one problem from dihybrid cross. 10

Q.2 Solve one problem based on blood group inheritance. 10

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.) 20

Q.4 Identification of human syndromes (any two) 10

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. 10

a) Humans pedigree analysis (Any five symbols)

b) Sickle cell anemia –slide/photograph/ charts.

OR

Problems based on Hardy- Weinberg Principle for the calculation of -----

Q.6 Identify and comments on as per the instructions. 20

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 10
Q.8 Viva- Voce and excursion report. 10

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Faculty of Science

B.Sc. Second Year

Sub:- Zoology (Anatomy, Physiology, Endocrinology, Histology and
Biochemistry)

Question Paper Pattern (XI)

Time- 4 Hours

Max. M. 100

- Q.1 Qualitative detection of digestive enzymes. (Protease, amylase and lipase)
in Cockroach/Crab. 15

OR

Detection of Human Salivary Amylase.

- Q.2 Estimation of O₂ Consumption in fish/crab/ or any suitable aquatic animal. 15

OR

Detect any two nitrogenous waste products from given sample provide and
report the test, observation and result.

- Q.3 Estimate the hemoglobin percentage in a given sample of blood. 10

OR

Measurement of Blood pressure in Man.

- Q.4 Counting of R.B.C./ W.B.C. in blood sample provided. 10

OR

Prepare Haematin crystals from Blood sample provided.

OR

Detection of Blood groups form given sample.

- Q.5 Dissect Rat/Frog/Fish so as to expose any two endocrine glands. 10

OR

Identify any two endocrine glands in charts/model provided.

OR

Stain & identify given Histological tissue ribbon (Mammalian)

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| Q.6 | Identify and describe the four Histological slides. | 20 |
| Q.7 | Submission of any five slides and excursion report. | 10 |
| Q.8 | Viva-voce and record book. | 10 |