

**ZOOLOGY SYLLABUS FOR III SEMESTER**  
**PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR**  
**BIOLOGY AND EVOLUTION**

**HOURS: 60 (5X12)**  
**Marks: 100**

**Max.**

**Unit – I      Cell Biology**

- 1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma
- 1.2 Electron microscopic structure of animal cell.
- 1.3 Plasma membrane –Models and transport functions of plasma membrane.
- 1.4 Structure and functions of Golgi complex, Endoplasmic Reticulum and Lysosomes
- 1.5 Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes

**(Note: 1. General pattern of study of each cell organelle –**  
Discovery, Occurrence, Number, Origin, Structure and  
Functions with suitable diagrams)

**2. Need not study cellular respiration under  
mitochondrial functions)**

**Unit – II      Genetics - I**

- 2. 1 Mendel's work on transmission of traits
- 2. 2 Gene Interaction – Incomplete Dominance, Codominance, Lethal Genes
- 2. 3 Polygenes (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance
- 2. 4 Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo-diploidy types of sex determination)
- 2. 5 Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)

### **Unit – III        Genetics - II**

- 3.1 Mutations & Mutagenesis
- 3.2 Chromosomal Disorders (Autosomal and Allosomal)
- 3.3 Human Genetics – Karyotyping, Pedigree Analysis (basics)
- 3.4 Basics on Genomics and Proteomics

### **Unit IV:        Molecular Biology**

- 4.1 Central Dogma of Molecular Biology
- Basic concepts of -
  - a. DNA replication – Overview (Semi-conservative mechanism, Semi- discontinuous mode, Origin & Propagation of replication fork)
  - b. Transcription in prokaryotes – Initiation, Elongation and Termination, Post- transcriptional modifications (basics)
  - c. Translation – Initiation, Elongation and Termination
- 4.2 Gene Expression in prokaryotes (Lac Operon)

### **Unit - V**

- 5.1 Origin of life
- 5.2 Theories of Evolution: Lamarckism, Darwinism, Germ Plasam Theroy, Mutation Theory
- 5.3 Neo-Darwinism: Modern Synthetic Theory of Evolution, Hardy-Weinberg Equilibrium
- 5.4 Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection, Speciation

### **REFERENCES:**

1. Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell  
‘Molecular Cell Biology’ W.H.Freeman and company New York.
2. Cell Biology by De Robertis
3. Bruce Alberts, Molecular Biology of the Cell

4. Rastogi, Cytology
5. Varma & Aggarwal, Cell Biology
6. C.B. Pawar, Cell Biology
7. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. Wiley India.
8. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc.
9. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cummings.
10. Russell, P. J. (2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.
11. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction to Genetic Analysis. IX Edition. W. H. Freeman and Co.
12. Ridley, M. (2004). Evolution. III Edition. Blackwell Publishing
13. Molecular Biology by freifielder
14. Instant Notes in Molecular Biology by Bios scientific publishers and Viva Books Private Limited
15. Hall, B. K. and Hallgrimsson, B. (2008). Evolution. IV Edition. Jones and Bartlett Publishers
16. Campbell, N. A. and Reece J. B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.
17. Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
18. Minkoff, E. (1983). Evolutionary Biology. Addison-Wesley.
19. James D. Watson, Nancy H. Hopkins 'Molecular Biology of the Gene'
20. Jan M. Savage. Evolution, 2nd ed, Oxford and IBH Publishing Co., New Delhi.
21. Gupta P.K., 'Genetics

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for BOS in zoology, UG  
K.V.R. GOWDAR  
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for BOS in zoology (UG)  
KVR GOWDAR

## **ZOOLOGY SYLLABUS FOR IV SEMESTER**

### **PAPER – IV: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY**

**HOURS: 60**

**Max. Marks: 100**

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#### **UNIT I        Animal Physiology - I**

- 1.1 Process of digestion and assimilation
- 1.2 Respiration - Pulmonary ventilation, transport of oxygen and CO<sub>2</sub> (Note: Need not study cellular respiration here)
- 1.3 Circulation - Structure and functioning of heart, Cardiac cycle
- 1.4 Excretion - Structure and functions of kidney urine formation, counter current Mechanism

#### **UNIT II Animal Physiology - II**

- 2.1 Nerve impulse transmission, - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers, Synapse.
- 2.2 Muscle contraction - Ultra structure of muscle, molecular and chemical basis of muscle contraction
- 2.3 Endocrine glands - Structure, functions of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas
- 2.4 Hormonal control of reproduction in a mammal

#### **UNIT III Cellular Metabolism – I (Biomolecules)**

- 3.1 Carbohydrates - Classification of carbohydrates. Structure of glucose
- 3.2 Proteins - Classification of proteins. General properties of amino acids

3.2 Lipids - Classification of lipids

3.4 Enzymes: Classification and Mechanism of Action

#### **UNITIV Cellular Metabolism – II**

4.1 Carbohydrate Metabolism - Glycolysis, Krebs cycle, Electron Transport Chain, Glycogen metabolism, Gluconeogenesis, Glycogenolysis

4.2 Lipid Metabolism –  $\beta$ -oxidation of palmitic acid

4.3 Protein metabolism - Transamination, Deamination and Urea Cycle

#### **Unit – V Embryology**

5.1 Gametogenesis

5.2 Fertilization

5.3 Types of eggs

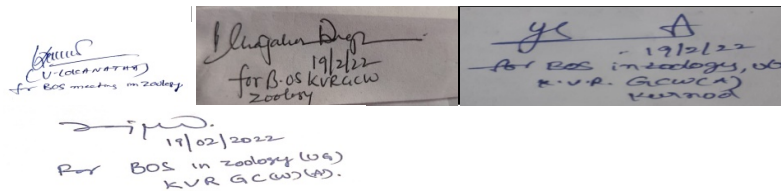
5.4 Types of cleavages

5.5 Development of Frog upto formation of primary germ layers

#### **REFERENCE BOOKS**

1. Eckert H. *Animal Physiology: Mechanisms and Adaptation*. W.H. Freeman & Company.
2. Flory E. *An Introduction to General and Comparative Animal Physiology*. W.B. Saunders Co., Philadelphia.
3. Goel KA and Satish KV. 1989. *A Text Book of Animal Physiology*, Rastogi Publications, Meerut, U.P.
4. Hoar WS. *General and Comparative Physiology*. Prentice Hall of India, New Delhi.
5. Lehninger AL. Nelson and Cox. *Principles of Biochemistry*. Lange Medical Publications, New Delhi.
6. Prosser CL and Brown FA. *Comparative Animal Physiology*. W.B. Saunders Company, Philadelphia.
7. Developmental Biology by Balinsky
8. Developmental Biology by Gerard Karp
9. Chordate embryology by Varma and Agarwal

10. Embryology by V.B. Rastogi
11. Austen CR and Short RV. 1980. *Reproduction in Mammals*. Cambridge University Press.
12. Gilbert SF. 2006. *Developmental Biology*, 8<sup>th</sup> Edition. Sinauer Associates Inc., Publishers, Sunderland, USA.
13. Longo FJ. 1987. *Fertilization*. Chapman & Hall, London.
14. Rastogi VB and Jayaraj MS. 1989. *Developmental Biology*. Kedara Nath Ram Nath Publishers, Meerut, Uttar Pradesh.
15. Schatten H and Schatten G. 1989. *Molecular Biology of Fertilization*. Academic Press, New York.



**ZOOLOGY SYLLABUS FOR SEMESTER - IV**  
**COURSE – 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**HOURS : 60**

**Max. Marks:**

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**Unit – I Immunology – I (Overview of Immune system)**

- 1.1 Introduction to basic concepts in Immunology
- 1.2 Innate and adaptive immunity, Vaccines and Immunization programme
- 1.3 Cells of immune system
- 1.4 Organs of immune system

**Unit – II Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity)**

- 2.1 Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvants; Factors influencing immunogenicity
- 2.2 Antibodies: Structure of antibody, Classes and functions of antibodies
- 2.3 Structure and functions of major histocompatibility complexes
- 2.4 Exogenous and Endogenous pathways of antigen presentation and processing
- 2.5 Hypersensitivity – Classification and Types

**Unit – III Techniques**

- 3.1 Animal Cell, Tissue and Organ culture media: Natural and Synthetic media,
- 3.2 Cell cultures: Establishment of cell culture (primary culture, secondary culture, types of cell lines; Protocols for Primary Cell Culture); Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures
- 3.3 Stem cells: Types of stem cells and applications
- 3.4 Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb)

## Unit – IV Applications of Animal Biotechnology

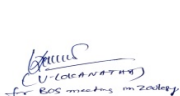
- 4.1 Genetic Engineering: Basic concept, Vectors, Restriction Endonucleases and Recombinant DNA technology
- 4.2 Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated gene delivery
- 4.3 Transgenic Animals: Transgenic - fish; applications
- 4.4 Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization, super ovulation, Embryo transfer, Embryo cloning

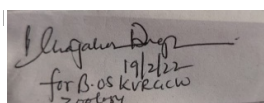
## Unit - V

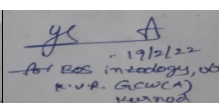
- 5.1 PCR: Basics of PCR.
- 5.2 DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing (2 hrs)
- 5.3 Hybridization techniques: Southern, Northern and Western blotting
- 5.4 DNA fingerprinting: Procedure and applications
- 5.5 Applications in Industry and Agriculture: Fermentation: Different types of Fermentation and Downstream processing; Agriculture: Monoculture in fishes, polyploidy in fishes.

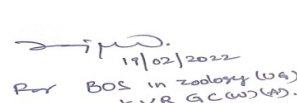
## REFERENCE BOOKS

1. Immunology by Ivan M. Riott
2. Immunology by Kubey
3. Sreekrishna V. 2005. *Biotechnology –I, Cell Biology and Genetics*. New Age International Publ. New Delhi, India.

  
V. (G. ANATHY)  
for BOS meeting in Zoology

  
19/2/22  
for BOS KVRGCW  
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