

**Bajaj College of Science, Wardha**  
**(An Autonomous College)**  
**Department of Zoology**  
**Syllabus for M.Sc. Zoology (Semester Pattern)**  
**Semester – III**  
**Choice Based Credit System**

(With effect from academic session 2022-23 As per BOS dated 12-04-2022)

**Semester- III**

**Paper- IX, Parasitology and Immunology**

PG- ZOO (07)- S3-T1

**Unit I :**

- 1.1 *Vibrio cholera and Clostridium titani*- Life cycle, mode of transmission, infection and treatment
- 1.2 *Yersinia pestis*- Life cycle, mode of transmission, infection and treatment
- 1.3 Influenza and H1 N1 viruses- Life cycle, mode of transmission, infection and treatment.
- 1.4 Dengue and Hepatitis- Life cycle, mode of transmission, infection and treatment

**Unit II:**

- 2.1 *Trypanosoma and Entamoeba* - Life cycle, mode of transmission, infection and treatment
- 2.2 *Leishmania and Malaria*- Life cycle, mode of transmission, infection and treatment
- 2.3 *Wuchereria and Trichinella* - Life cycle, mode of transmission, infection and treatment
- 2.4 Toxins and antitoxins

**Unit III:**

- 3.1 Immune system- innate and adaptive immunity; Antigens and antibodies and its interaction
- 3.2 Cells and organs of immune system; T cells and B cells - maturation, activation and differentiation, T cell receptors
- 3.3 Major Histocompatibility Complex (MHC)- general organization and inheritance of the MHC, MHC molecules and genes
- 3.4 Complement system- classical, alternative and lectin pathways, regulation of complement system, biological consequences of complement activation

**Unit IV:**

- 4.1 Cytokine receptors- properties of cytokines, cytokine receptors, cytokine secretion by TH1 and TH2 subsets; Cell mediated cytotoxic responses- effector mechanisms, leukocyte activation and migration.
- 4.2 Hypersensitivity reactions- types, mechanisms of type I to IV hypersensitivity reactions; Autoimmunity- Organ specific autoimmune disease and treatment
- 4.3 Transplantation immunology- blood antigens, transplantation rejection, graft rejection, familial grafting, tissue typing, cross matching, immunosuppression.
- 4.4 Tumor immunology- Types and roles of tumor antigens, immune response to tumor; Immunotechniques- RIA and ELISA

## **Semester -III**

### **Paper-X, Special Group-Animal Physiology-I**

PG- ZOO (07)- S3-T2-SP1

## **Physiology of Digestion and Excretion**

### **Unit-I**

- 1.1 Histology of salivary glands, Mechanism of salivary secretion, composition and functions of saliva.
- 1.2 Histology of stomach, mechanism of secretion of gastric juice, composition and functions of gastric juice.
- 1.3 Histology of pancreas, mechanism of pancreatic secretion, composition and functions of pancreatic juice.
- 1.4 Histology of liver, bile secretion, its composition and functions.

### **Unit-II**

- 2.1 Histology of small and large intestine, intestinal glands, its secretion and control, intestinal bacteria.
- 2.2 Neural and endocrine regulation of gastro intestinal movements and secretions.
- 2.3 Gastrointestinal hormones - Synthesis, chemical structure and functions.
- 2.4 Digestion and absorption of proteins, carbohydrates and fats in the gastrointestinal tract.

### **Unit-III**

- 3.1 Functional anatomy of kidney.
- 3.2 Mechanism of formation of urine.
- 3.3 Normal and abnormal constituents of urine.
- 3.4 Mechanism of concentration and dilution of urine – The Counter current system.

### **Unit-IV**

- 4.1.1 Regulation of urine and body fluid concentration and volume, hormonal mechanism of Antidiuratic hormone, Aldosterone and Renin – Angiotensin system in renal physiology.
- 4.2 Regulation of water, electrolytes and acid base, renal clearance.
- 4.3 Physiology of nitrogen excretion
- 4.4 Renal failure.

## **Semester –III**

### **Paper-XI, Special Group- Animal Physiology-II**

PG- ZOO (07)- S3-T3-EL1

## **Physiology of Circulation**

### **Unit-I**

- 1.1 Types of heart (Myogenic and Neurogenic ).
- 1.2 Anatomy, histology and nerve innervation of the heart, heart valves.
- 1.3 Pace maker and specialized conducting fibers.
- 1.4 Blood pressure and factors affecting blood pressure.

### **Unit-II**

- 2.1 Cardiac cycle, Electrocardiogram (ECG).
- 2.2 Cardiac output, heart sound.
- 2.3 Haemodynamics.
- 2.4 Cardiac Failure.

### **Unit-III**

- 3.1 Cellular composition and functions of blood.
- 3.2 Blood groups and Blood transfusion.
- 3.3 Blood sugars – Causes and control of hypoglycemia and hyperglycemia
- 3.4 Blood lipids- Causes and control of hypolipidimia and hyperlipidimia

### **Unit-IV**

- 4.1 Plasma proteins- Albumins, globulins.
- 4.2 Haemostasis, Cascade of biochemical reactions involved in coagulation of blood.
- 4.3 Transport of O<sub>2</sub> & CO<sub>2</sub> by blood.
- 4.4 Lymph – composition, formation and functions.

## **Semester III**

### **Core (Subject Centric)- I**

#### **Paper- XII - BIOTECHNIQUES – I\* (for by PG Zoology students)**

PG- ZOO (07)- S3-T4-FC1

(With effect from academic session 2022-23 As per BOS dated 12-04-2022)

#### **Unit I : MICROSCOPY**

- 1.1 Properties of light: Nature of light, wavelength, reflection, refraction, polarization
- 1.2 Microscopes: Principles and application
- 1.3 Light Microscopy, Phase Contrast Microscopy, Fluorescence microscopy
- 1.4. Scanning and transmission electron microscopy and Atomic Force microscopy

#### **Unit II: SPECTROSCOPY**

- 2.1 Spectroscopy: Basic Principles and applications
- 2.2 Types of Spectroscopy : UV visible, IR absorption spectroscopy, Raman Spectroscopy
- 2.3 Principle and Biological application of Mass Spectroscopy
- 2.4 X-ray diffraction (XRD) and NMR

#### **Unit III: Separation techniques in Biology**

- 3.1 Chromatography : Principle and types
- 3.2 Adsorption and partition chromatography
- 3.3 Size exclusion and ion exchange chromatography
- 3.4 Molecular separation by affinity chromatography,

#### **Unit IV: Microbiological Techniques**

- 4.1 Media preparation and sterilization.
- 4.2 Inoculation and growth monitoring.
- 4.3 Use of fermenters.
- 4.4. Microbial assays

## Semester-III, Practical-V, Parasitology and Immunology

PG- ZOO (07)- S3-P1

### Section-A

1. Study of different types of parasitic protozoan's with the help of already available permanent slides/ ICT tools/ Models/ Charts/ Photographs etc.
2. Study of different types of parasitic helminthes with the help of already available specimens, permanent slides/ ICT tools/ models/ charts/ photographs etc.
3. Study of different types of insect vectors with the help of already available specimens, permanent slides/ ICT tools/ models/ charts/ photographs etc.
4. Identification and study of various ecto and endo parasites with the help of already available permanent slides/ ICT tools/ models/ charts/ photographs etc.
5. Study of different types of insect vectors and their mouth parts with the help of already available specimens, permanent slides/ ICT tools/ models/ charts/ photographs etc.
6. Study of life cycles of various parasites with the help of already available specimens, permanent slides/ ICT tools/ models/ charts/ photographs etc.
7. Demonstration of Gram positive and Gram negative bacteria.
8. Demonstration of immunoelectrophoresis.

### Section-B

9. Immunological diagnosis of pregnancy.
10. Preparation of tissue sections of thymus, spleen, and lymph nodes. (Source of tissue: Animal wastes from local recognized slaughter houses/ poultry farms/ fish markets etc.)
11. Agar gel diffusion.
12. Identification and study of T and B cells with the help of already available permanent slides/ ICT tools/ models/ charts/ photographs etc.
13. Demonstration of Mast cells. (Source of tissue: Animal wastes from local recognized slaughter houses/ poultry farms/ fish markets etc.)
14. Demonstration of Ouchterlony double diffusion (ODD).

#### Distribution of marks

	Marks
1. Identification and comments on spot (1 to 10)	30
2. Demonstration of Gram +ve (Positive), Gram -ve (Negative) bacteria.	15
3. Antigen-antibody reaction/Agar gel diffusion/diagnosis of pregnancy	15
4. T and B cells identification/Mast cell demonstration	15
5. Submission of photographs of vectors	05
6. Practical record	10
7. Viva-voce	10

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**Total marks** 100

## Semester-III Practical-VI, Special Group- Animal Physiology

PG- ZOO (07)- S3-P2

### I. Physiology Experiments

- 1 Effect of pH, temperature and incubation on human salivary amylase activity.
- 2 Determination of :-
  - a) Clotting time, bleeding time.
  - b) Erythrocyte sedimentation rate and c) Hemoglobin concentration.
- 3 Study of structure of RBCs in vertebrates with the help of already available permanent slides/ ICT tools/ models/ charts/ photographs etc.
- 4 Total leukocyte count and differential leukocyte count.
- 5 Total erythrocyte count.

### II. Quantitative Analysis

- 1 \*Estimation of blood Glucose by oxidase enzymatic technique (Source of blood: Local recognized pathology laboratory)
- 2 \*Estimation of blood proteins by Bradford's technique (Source of blood: Local recognized pathology laboratory)
- 3 Estimation of blood triglycerides (Source of blood: Local recognized pathology laboratory)
- 4 Estimation of blood cholesterol (Source of blood: Local recognized pathology laboratory)
- 5 Estimation of blood Sodium, potassium, Calcium (Source of blood: Local recognized pathology laboratory)
- 6 Estimation of blood alkaline & acid phosphatase (Source of blood: Local recognized pathology laboratory).
- 7 \*Separation of biomolecules by Gel filtration chromatography (Source of blood: Local recognized pathology laboratory).

### III. Qualitative Analysis

- 1 Normal & abnormal constituents of human urine.
- 2 Blood group detection by antisera.
- 3 Preparation and study of Urine crystals.
- 4 Estimation of serum urea by diacetyl monoxime method (Source of blood: Local recognized pathology laboratory)
- 5 Preparation and study of haemin crystals.

**IV. Histological Study of Stomach, Liver, Small intestine, Large intestine, Pancreas, Kidney, Thyroid, Pituitary, Blood smear, Heart, T.S. Vein, T.S. Artery with the help of already available permanent slides/ ICT tools/ charts/ photographs etc.**

#### Distribution of Marks:

	Marks - 100
1. Physiology Experiment	20
2. Major quantitative analysis	20
3. Minor quantitative analysis	10
4. Qualitative analysis	15
5. Identification and comment on spots(1-5)	15
6. Practical Record	10
7. Viva-voce	10

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Total marks 100

## **Suggested Readings**

### **Parasitology**

1. Brock Biology of Microorganisms (Ed. IX) M. T. Madigan J. M. Martinko and J.Parker. Prentice Hall International Publication.
2. The Nematode Parasite in Vertebrate, W. Youle and Maplestone.
3. General Parasitology, V. A. Dogiel.
4. Helminthology, E. C. Fausy.
5. Platyhelminthes and Parasitism, D.R.Birt.
6. Animal Parasite- O.W. Aisen
7. Parasitic Protozoa, J.P. Kreier and J.R. Baker. Allen and Unwin Press.
8. Medical and Veterinary Protozoology M. G. Kathering , A. James paul and V. Zaman. Churchill Livingstone

1. Immunology – R. C. Kuby et al.
2. Immunology - Tizzard.
3. Immunology -. Roitt, Brostoff and D. Male.
4. Microbiology- M. T. Pelzer. Jr. E. C. S. Chan and N. R. Krieg. Tata McGraw – Hill Immunology - Abbas

### **Physiology**

1. Bell, G.E. & Davidson, J.N. & Emslie D. Smith- Text Book of Physiology & Biochemistry.
2. Medical Physiology: A Wiley Medical Publication, John Wiley & Sons, New York.
3. Comar, C.L. & Felix Bronner (1961) - Mineral Metabolism, Acad Press, New York & London.
4. Dayson (1964)- A Text Book of General Physiology: Little Brown & Co. Boston.
5. R. Eckert & D. Randall (1983) - Animal Physiology: W.H. Rexeman & Co.
6. M.A. Edwards & K.A. Hassall (1980) - Biochemistry & Physiology of the Cell: (2nd Edn.), Mc. Graw Hill Co.
7. Cuthe F. (1968)- The Physiology of Cells: The Macmillan Co.
8. Guyton, A.G. (1968)- Textbook of Medical Physiology: 7th Edn. Saunders Pub.
9. C.L. Prosser - Comparative Animal Physiology ,W.B. Saunders & Company.
10. R. Eckert - Animal Physiology: Mechanism & Application, W.H. Freeman & Company.
11. W.S. Hoar- General & Comparative Animal Physiology.
12. W.F. Ganong (1981) -Medical Physiology 10th Edn. Lange Medical Publications.

## **Biotechniques – I \***

1. Robert Broun, McGraw Hill International Edition -Introduction to instrumental analysis.
2. K. Wilson and K.H. Goulding ELBS Edition.54 - A Biologist Guide to Principle and Techniques of Practical Biochemistry
3. Alcamo -DNA Techniques.
4. Ed. M. F. A. Goosen, A.J. Daugulis and P.Faulkner -Insect Cell Culturing Engineering.
5. B. D. Singh -Biotechnology.
6. Pranav kumar edition II -Fundamentals and techniques of biophysics and molecular biology,