

**POST GRADUATE DIPLOMA IN**  
**PUBLIC HEALTH ENTOMOLOGY**

## **Part A SEMESTER I**

### **Paper IA (DPHE 1- CT-01A)**

#### **Anophelines, Culicines and their medical importance**

##### **UNIT I**

General characteristics of Mosquitoes, Differentiation between anophelines and culicines and characteristic features of genus Anopheles, Culex, Aedes and Mansonia. Resting, feeding and Breeding habits of adults; Gonotrophic cycle.

##### **UNIT II**

Life cycle of Malaria Mosquitoes and Transmission factors.

**Malaria:** Distribution of malaria vectors in India. Epidemics: Concepts and control/management. Principles of malaria eradication and control: Malaria Control in India – NMCP, NMEP, MPO, PfCP, UMS, RBM, EMCP, NVBDCP, WHO, Global Malaria Control Strategy. Transgenic mosquitoes.

##### **UNIT III**

Life cycle of filaria Mosquitoes and Transmission factors.

**Lymphatic filariasis** Biology and ecology of Culex quinquefasciatus and Mansonioides vectors, Survey methods: Conventional – entomological; Prophylaxis and control; National and international scenario

##### **UNIT IV**

**Arboviral diseases**-Japanese encephalitis: Geographical distribution – vectors, Dengue and chikungunya: Distribution – vectors – transmission, Prophylaxis and control; National and international scenario

##### **UNIT V**

Epidemiological indices: Infection and infectivity rates, vector density, Annual biting rate, mf rate, mf density, endemicity rate, Annual infective biting rate, Transmission Intensity Index (TII) and Annual Transmission Potential (ATP). National Filaria Control Programme in India LF elimination strategy – Annual single dose MDA and Morbidity management measures

## Paper II A (DPHE 1- CT-02A)

### Sand flies, Black flies, Muscoid flies and their medical Importance

#### UNIT I

**Phlebotomid sandflies** Classification of family Psychodidae –Differences between the genus Phlebotomus and Sergentomyia - Habitat – Habit – Distribution -Morphology of mouth parts and reproductive system – Biology of immature – Behaviour of adults; feeding, resting and oviposition behaviour - Gonotrophic cycle.

#### UNIT II

**Muscoid flies (filth breeding flies):** Classification - Habitat – Habit – Distribution - Morphology of mouth parts and reproductive system – Biology of immature – Behaviour of adults; feeding, resting and oviposition behaviour. Impact of sanitation on fly abundance.

#### UNIT III

**Muscoid flies (Myiasis flies):** Morphology of mouth parts and reproductive system – Mode of infection of myiasis maggots – Accidental, facultative and obligatory myiasis – Characteristic features of myiasis flies - Medical importance of myiasis in human.

Tsetse flies: Biology: life cycle and distribution, Biology of immature – Behaviour of adults; feeding, resting and oviposition behaviour.

#### UNIT IV

**Black flies:** Classification of family Simuliidae - Habitat – Habit – Distribution - Morphology of mouth parts and reproductive system – Biology of immature and adult – Disease transmission cycle.

#### UNIT V

##### **Forensic Entomology and Flies**

Present status and recent advances in detection of crime with different types of insects specially flies. Observations pattern on the succession pattern of different types of flies on an animal caracace: A case study.

## Paper III A (DPHE 1 -CT-03A)

### Other Arthropods of Medical and Veterinary Importance

#### UNIT I

**Fleas** – Classification Morphology and life cycle of fleas Distribution and transmission cycle of Plague and Murine typhus

**Lice** – Classification Morphology and life cycle of lice Distribution and transmission cycle of Epidemic typhus and Relapsing fever

#### UNIT II

**Ticks** – Classification Morphology and life cycle of ticks Distribution and transmission cycle of Kyasanur Forest Disease (KFD) and Tick Typhus

**Mites** – Classification Morphology and life cycle of mites Distribution and transmission cycle of Scrub typhus and Scabies.

#### UNIT III

**Arthropods as vectors of human diseases:** Modes of disease transmission: vertical and horizontal transmission - biological, mechanical and contact - transmission cycle - interseasonal maintenance.

Bugs: Reduviid bugs and bed bugs: Distribution, domiciliary forms and sylvatic forms; Modification of head size in relation to feeding - Structural and functional morphology and reproduction and life cycle - defecation – parasite transmission and disease spread

#### UNIT IV

Cockroaches: Distribution and morphological characteristics ; Importance of cockroaches - mechanical carriers of parasite, pathogens - pest or disease vectors - and life cycle - feeding, resting behaviour - factors favouring breeding – Environmental and chemical control – feasibility and effectiveness; parasitoids and cockroaches

#### UNIT V

Cyclops: Distribution, morphology of Cyclops – Different species and vectors of dracunculiasis - and Aquatic habitats and breeding – life span – man and Cyclops – invasion and disease transmission - protected water supply and disease control – anti Cyclops measures - Control programme and achievements

Venomous arthropods: Hazards posed by spiders, scorpions, ants, bees, wasps

## **Paper IV A (DPHE 1- CT-04A)**

### **Integrated Methods of Vector Management**

#### **UNIT I**

##### **Chemical Control of Vectors:**

Insecticides - Classes of insecticides - Organochlorine (OC), Organophosphorus (OP), Carbamates (C), Pyrethroids (PY)

Insect Growth Regulators (IGR) - Repellents & attractants - Formulations- solid and liquid formulations Mode of action of insecticides OC, OP, C, PY & IGRs - Mechanism of resistance - Methods of overcoming resistance problem

#### **UNIT II**

Insecticide Application Equipments: Types - Application - Types of nozzle - Determination of droplet size - classification of different sprays - Application procedures: Application rates - conversion factors - preparation of spray suspension - conversion tables for dosages - Area measurement and dosage determination.

IVM approaches, importance and advantages: Fundamentals of IVM - Appropriate methods in vector management - Criteria for vector control options

#### **UNIT III**

Insecticide Resistance and Management Present status of insecticide resistance - Impact of insecticide resistance on the control of vectors - Socio economic impact of resistance (Administrative, operational, Financial, Social and Agricultural implications) - Detection and monitoring of vector resistance - Insecticide targets and mechanism of resistance - Resistance management.

Eco-environmental Systems: Food chain / Web – Prey and Predator interactions - Principles of an eco-epidemiological approach to address multiple vector borne diseases - Water Management

#### **UNIT IV**

Agriculture and Public Health Practices: Water, Fertilizers, Pesticides effects on insects - Integration of IPM and IVM – Regulation and Policy related to vector control – Environmental & health Impact Assessment – Implementation of IVM Strategy

#### **UNIT V**

Community participation: Community participation in vector management - Community empowerment – sustenance of participation – Inter-sectoral collaboration.

Information, Education and Communication: KAP assessment – Communication strategies such as communication for behavioral impact (COMBI)/ behavioral change and communication (BCC)

### **Practicals IA (DPHE 1 -CP-01A)**

1. Collection & Identification of Ticks and mites, Bed bugs, Triatomine bugs, Fleas, Head louse, Body louse, Cockroaches, Houseflies, Sandflies, Black flies
2. Mounting  

Mouth parts, Wing, Different types of hairs and scales of thorax and abdomen/head/wing, Palpi, Scutellum, Hind leg-characteristics of different segments, Male genitalia, Egg, larvae, Pupae – description of siphon, respiratory trumpet of collected materials
3. Differentiation between Anopheles, Aedes and Culex
4. Field survey for Anophelines  

**Adult stage-** Indoor and Outdoor resting mosquitoes – density measurement

**Laval Stage-** breeding habitats (a) Collection and rearing of larval samples (b) Measuring the immature density (c) Identification of larvae and emerged adults
5. Assessment of man-vector contact
6. Age determination & Estimation of gonotrophic cycle
7. Dissection of Culex quinquefasciatus and demonstration of various filarial larval
8. Observing and understanding the characteristic features of the life stages of the genus Phlebotomus, Musca, Chrysomyia, Simulium etc. with live or preserved specimens. Identification of some of the flies of forensic importance.
9. Techniques involved in rearing some of the medically important insects.
10. Forensic Entomology : Time of Death, Decomposition, and the Insects Used in Death Investigation

## **Practicals II A (DPHE 1-CP-02A)**

1. Demonstration of representative specimens of fleas, lice, ticks and mites
2. Collection, sampling and live demonstration of vectors
3. Incidence and surveillance around tribal belt , A case study
4. Identification of bugs, cockroaches and Cyclops
5. Mounting of mouthparts and salivary glands of cockroaches
6. Laboratory evaluation of mosquito larvicide
7. Handling of different pesticide application equipments-Pneumatic sprayer for indoor residual sprayer, Knapsack sprayer for larviciding, thermal fogger for space spraying
8. Determination of larval susceptibility to different insecticides: Preparation of stock solutions and various concentrations; Methods of testing.
9. Determination of adult susceptibility to different insecticides: Preparation of insecticide impregnated papers; methods of testing using WHO test kit.
10. Monitoring of insecticide resistance in field strains against larvicides/adulticides
11. Residue analysis (Colorimetric methods; HPLC Technique)

## **Part B SEMESTER II**

**(To be completed at AIIMS, Jodhpur)**

**Paper -IB ( DPHE 2-CT-05B)**

### **Anophiline and Culicine Diagnosis, treatment and prognosis**

#### **UNIT I**

Life cycle of human malaria parasites and Transmission factors. Taxonomic position of different species - Distinguishing characters of different species of human malarial parasites, Distribution of Plasmodium parasite species in India. Epidemiology: Malaria ecosystems – urban, rural, forest, coastal malaria with reference to vector ecology

#### **UNIT II**

Survey: Methods of vector incrimination - Conventional, immunological and molecular techniques; (Conventional – dissection and staining of salivary glands/Midgut, Molecular and immunological techniques), Epidemiological (parasitological and entomological) indices. Surveillance – Conventional, immunological and molecular methods for detection of parasites and species identification in humans. Treatment

#### **UNIT III**

Molecular and immunodiagnostic methods including xenomonitoring and PCR techniques for parasites and species identification

Chemotherapy: Selective treatment – mass drug administration – medicated salt – side reactions.

National and international status and drug policy - drug resistance and its detection by conventional and molecular techniques. Role of WHO and other National institutes in eradication of mosquito borne diseases

#### **UNIT IV**

Lymphatic filariasis: History and geographic distribution of lymphatic filariasis - Taxonomic position of different species - Distinguishing characters of different species/strains, Life history of *Wuchereria bancrofti* and *Brugia malayi*; Parasite morphology and microfilariae periodicity; Biology and ecology of *Culex quinquefasciatus* and *Mansonioides* vectors; Survey methods– parasitological and clinical

Brief description of zoonotic parasites and animal models.

#### **UNIT V**

##### **Arboviral pathogens**

Classification of Arboviruses - Dengue, Chikungunya, Japanese encephalitis, Zika, West Nile, and Yellow fever viruses - Geographic distribution - Viral structure and replication - Transmission and maintenance cycle.



**Paper II B ( DPHE 2-CT-06B)**

**Sand flies, Black flies, Muscoid flies and their medical Importance**  
**Medical importance of sand fly – borne diseases: MAJOR Diseases**  
**arising from sand flies black flies and muscoid flies**

**UNIT I**

Major diseases arising from sand flies, their symptoms, prevalence, distribution, prognosis, diagnosis and control

**UNIT II**

Major diseases arising from black flies, their symptoms, prevalence, distribution, prognosis, diagnosis and control with special reference to Simuliidae family

**UNIT III**

Major diseases arising from muscoid flies, their symptoms, prevalence, distribution, prognosis, diagnosis and control

**UNIT IV**

Present status – recent advances in managing these diseases with special reference to kala azar. Cutaneous Chandipura virus: prevalence and distribution.

**UNIT V**

Various National Vector Borne Disease Control Programmes in India  
Role of WHO and major National institutes in eradication of fly borne diseases

## Paper III B ( DPHE 2-CT-07B)

### Other Arthropods of Medical and Veterinary Importance

#### UNIT I

Prevalence of diseases transmitted by fleas, lice, ticks and mites in India

The triatomines or reduviidae (bed bugs) transmit Chagas disease (American trypanosomiasis).

#### UNIT II

Different bacterial infections: bartonellosis (Trench fever), borreliosis (relapsing fever), and certain types of rickettsiosis (typhus).

Plague and rickettsial pathogens - morphology & identification

#### UNIT III

Lyme disease, tick-borne meningoencephalitis, KFD Disease, Crimean–Congo hemorrhagic fever, tick-borne relapsing fever, Q fever, the tick-borne spotted fevers, babesiosis, ehrlichiosis, tularemia.

#### UNIT IV

Cockroaches: Environmental management: cleanliness and hygiene, reduction of accessibility - chemical and biological control - baits and traps - repellents - modern methods.

Diseases caused by bugs and other arthropods, their symptoms, diagnosis, prevention and control

#### UNIT V

**Diseases associated with rodents:** Plague - Salmonellosis - Leptospirosis - chemotherapy and prevention and control.

Role of WHO, WHOPS and major National Institutes in eradication of flea, lice, tick and mite borne diseases

## Paper IV B ( DPHE 2-CT-08B)

### Biological & Environmental Methods for the Control of Vectors

#### UNIT I:

Romanomermis species: life cycle, host susceptibility, biocontrol potential, mass production & application methods.  
Insect predators - Toxorhynchytes species, Aquatic bugs/beetles – efficacy on mosquito control and methods of application.

#### UNIT II:

Larvivorous fish: Different types – characteristic features  
Biocontrol/predatory potential – operational use – Mass culture – technique on field release, Precautions.

**Natural enemies of Arthropods-** Competitors - pathogens - parasites - parasitoids - predators - distribution and their role

#### UNIT III:

**Bio-larvicides:** Larvicidal bacilli: Bacillus thuringiensis, B. sphaericus.  
Pupicidal bacilli: B. subtilis and Pseudomonas fluorescens.

Fungal pathogens of mosquitoes: Coelomyces, Lagenidium, Beauveria & Metarhizium.

Production, formulation evaluation of bio control agents in the laboratory and field.

#### UNIT IV:

##### **Management of Public Health Pesticides**

Elements of management of public health pesticides: Product registration - Procurement - Label - Storage and transport - Distribution - Application - Disposal - surveillance of pesticide poisoning - Quality control; Safe use of pesticides: general principles of safety measures - medical surveillance; Operative procedures: Preparation of spray materials - House treatment with residual spraying - Larvicidal - Rodenticidal - Herbicidal treatments - Diagnosis and treatment of poisoning.

#### UNIT V:

Environmental modification and manipulation; equipments for environmental management; impact of environment management on the components of environment; planning, organization and evaluation of environment management measures; Personal protection measures.

## **Practical I B ( DPHE 2-CP-03B)**

1. Preparation of stains – JSB-I, JSB-II
2. Blood smear preparation and staining
3. Identification of malaria parasites-Plasmodium vivax, P. falciparum and P. malariae
4. Parasite counting and density grading
5. Public health workers, health centres, and Govt policies regarding Malaria
6. Night blood survey
7. Staining and examination of thick blood smears for M.F. ( Malaria Falciparum)
8. Demonstration of membrane filtration technique
9. Demonstration of ICT card test
10. Demonstration of Og4C3 technique
11. Clinical symptoms, Clinicopathological studies, Treatment Diagnosis, Prognosis and Vaccination process, Public health issues and Govt policies for Leishmaniasis, Kala-azar, and other diseases caused by Sand flies, Black flies and Mucoïd flies.

## **Practicals II B ( DPHE 2-CP-04B)**

- 1. Clinicopathological symptoms, Treatment, Medicine, Diagnosis and Prognosis, Public health awareness programme**
2. Demonstration of community mobilization techniques
- 3. Case study**
  1. Isolation and identification of bacterial pathogens
  2. Testing of mosquito larvicidal and pupicidal activity
  3. Slide show- mycopathogens
  4. R. iyengari-demonstration
  5. Identification of larvivorous fish
  6. Handling of equipments for Environmental Management
  7. Tools used for personal protection measures
- 4. Visit To Different Institutes Like ICMR And Vector Research Stations For General Identification And Disease Diagnosis And Management By Both Centres As A Part Of Project**

## **DEPARTMENT OF ZOOLOGY**

### **Annexure I (Details of dissertation)**

- In semester IV, students will be having dissertation in lieu of one Discipline Specific Elective (DSE) paper.
- The total contact hrs. for dissertation will be 8 hrs./week.
- The Dissertation can be completed within the department/ sister departments of this University/ any other approved institution.
- The students will have to submit a dissertation report as per the prescribed format given.
- The total credits and marks for dissertation will be the same as for other DSE.
- The evaluation scheme of the Dissertation report is given in Annexure 1.

### **General Guidelines for Preparation of Dissertation Report**

1. The students are advised to follow strictly the given guidelines to write their manuscript.
2. The front page of the report should be as per the format given.
3. The title should not contain any abbreviation and page should not be numbered.
4. Text should be in Times New Roman Font, with a font size of 12 point and spacing 1.5 on A 4 Size paper, with 1.5 inch margins throughout. Scientific names of the organisms should be in italics. Main headings (Summary, Introduction, Chapter details, Conclusions and References) should be bold type, justified and separated from the text.
5. The dissertation report must be of atleast 50 to 75 pages.
6. Literature citation in the text should be cited in alphabetic order. The APA form and style of references should be followed.
7. The students are advised to publish their dissertation in the form of research articles in UGC care listed journals.

TITLE MUST BE IN CAPITAL LETTERS, SIZE 21 AND  
CENTERED, WITH Scientific names IN ITALICS

Dissertation Report

Submitted for the partial fulfillment of the  
Degree of Master of Science

By

(Name of student)

[M.Sc. (ZOOLOGY), IV Semester]

Session

Logo of MLSU

DEPARTMENT OF ZOOLOGY

MOHANLAL SUKHADIA UNIVERSITY UDAIPUR

INSTITUTE NAME AND LOGO

Ref no.-.....

Date.....

CERTIFICATE

This is to certify that the dissertation report entitled “.....” submitted towards the partial fulfilment for the award of the degree of Master of Science in Zoology, from Mohanlal Sukhadia University, Udaipur (Rajasthan) India is the result of bonafide work compiled by Mr./Ms. .... carried out under the guidance of Dr. .... at ..... in the academic year ..... It is to certify that no part of the dissertation has been submitted for the award of any degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journals or magazines.

Date

Name & Signature of the supervisor

Seal of the supervisor



## **DECLARATION**

I, ..... Roll No. \_\_\_\_\_ student of M. Sc. IV Semester Zoology  
(Session 20-) hereby declare that the dissertation entitled “.....” is my own  
compilation. I have strictly adhered to the guidelines provided by the department for  
the preparation of the dissertation report.

Dated:

Name of student

Signature of the Student

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## MARKING SCHEME FOR DISSERTATION

M. Sc. ZOOLOGY Semester IV

S.No.		Maximum marks	Marks Obtained
1.	Dissertation Report		
	i. Review of Literature	15	
	ii. Methodology	10	
	iii. Outcome	15	
2.	Seminar	25	
3.	Viva – voce	15	
4.	Internal Assessment	20	
5.	<b>Total Marks</b>	<b>100</b>	

## INTERNAL ASSESSMENT

Name of Student's :

S.No.	Technical Competence	Maximum Marks	Minimum Marks
1.	Review of Literature	5	
2.	Experimental Design & Skills	5	
3.	Data Interpretation/ Result Analysis	5	
4.	Attendance	5	
	<b>GRAND TOTAL</b>	<b>20</b>	

Date

Name & Signature of the supervisor

Seal of the supervisor