



**GOVERNMENT OF MIZORAM
HEALTH & FAMILY WELFARE DEPARTMENT
MIZORAM SECRETARIAT BUILDING, MINECO, KHATLA
AIZAWL-796001**

...
Dated Aizawl, the 19th December, 2023

NOTIFICATION

No.A.11018/28/2016-HFW: In the interest of public service, the competent authority is pleased to notify Syllabus for Direct Recruitment to the post of Entomologist under Health & Family Welfare Department as per Appendix.

This supersedes the previous Notification of even no. dated 08.09.2023.

Sd/- ESTHER LAL RUATKIMI
Principal Secretary to the Govt. of Mizoram
Health & Family Welfare Department

Memo No.A.11018/28/2016-HFW : Dated Aizawl, the 19th Dec., 2023

Copy to:

1. P.S. to Minister, Health & Family Welfare Department.
2. P.S. to Principal Secretary, Health & Family Welfare Department.
3. Principal Director, Health & Family Welfare Department.
4. Director of Health Services.
5. Director, Hospital & Medical Education.
6. Controller, Printing & Stationary Department for publication in the Mizoram Gazette.
7. Guard file.

19/12/23
Under Secretary to the Govt. of Mizoram
Health & Family Welfare Department

**SYLLABUS FOR DIRECT RECRUITMENT TO THE POST OF ENTOMOLOGIST
(LEVEL 10) UNDER HEALTH & FAMILY WELFARE DEPARTMENT**

1) Paper – I General English	:	100 Marks
2) Paper - II General Studies	:	100 Marks
3) Paper – III (Technical Paper)	:	200 Marks
4) Paper – IV (Technical Paper)	:	200 Marks
5) Paper – V (Technical Paper)	:	200 Marks
Total	:	800 Marks

Notes:

1. Question in Paper – I shall be set either in multiple type questions or conventional type question.
2. Questions in Paper II shall be set in multiple type questions only.
3. 50% of questions in Paper III, IV and V (Technical Papers) shall be set in multiple type questions and the remaining 50% in conventional type questions.

DETAILS OF SYLLABUS:**PAPER – I (General English) – 100 marks**

(a) Précis Writing	:	14 Marks
(b) Letter Writing	:	10 Marks
(c) Comprehension of given passages	:	10 Marks
(d) Grammar: Parts of Speech (MCQ)	:	30 Marks
(e) Correct usage and Vocabularies (MCQ)	:	16 Marks
(f) Formation of Sentence (MCQ)	:	20 Marks

(i) Verbs

Tenses :

Present/past forms, Simple/continuous forms, Perfect forms, Future time reference

(ii) Sentence Structure

*Connectors**Types of sentences: Affirmative/interrogative sentences, Negation, Exclamations**Types of Phrases and Clauses: finite and non-finite subordinate clauses, noun clauses and phrases, adjective clauses and phrases, adverb clauses and phrases**Narration (Direct and Indirect speech)***PAPER – II (General Studies) - 100 Marks**

- (a) Current events of state, national and international importance : 12 marks
 - (b) History of India and Indian National Movement : 12 marks
 - (c) Indian and World Geography - Physical, Social, Economic Geography of India and the World : 12 marks
 - (d) Indian Polity and Governance - Constitution, Political System, Public Policy, Duties & Rights Issues: 12 marks
 - (e) Economic and Social Development Sustainable Development, Poverty, Inclusion, Demographics, Social Sector initiatives, and other related issues : 12 marks
 - (f) General issues on Environmental Ecology, Bio-diversity and Climate : 12 marks
 - (g) General Science: 12 marks
- The topics listed above shall cover the State of Mizoram wherever applicable.*
- (h) General awareness on Mizo culture, its heritage and society – 16 marks



Note: Paper III, IV, V are classified as Technical Papers. 50% of questions in Technical Papers shall be set in multiple choice questions and the remaining 50% shall be set in conventional type questions.

PAPER – III (TECHNICAL PAPER) – 200 marks

Insect Morphology, Taxonomy, Bio-diversity of Vectors and public health importance

UNIT – I (20 Marks)

Insect morphology: Types of mouth parts, antenna, legs and wings; structure of external genitalia in male and female.

Insect taxonomy: Classification of insect up to orders and modern approaches in insect classification. Insect development and life history: metamorphosis. Larval and pupal types, voltinism, diapause, polymorphism and polyphenism.

UNIT – II (26 Marks)

Insect physiology: respiratory and reproductive system. Types of Haemocytes and insect immunity. Insect biochemistry: Insect cuticle and chitin biosynthesis, colouration, physiology of moulting, sclerotization. Insect hormones.

UNIT – III (20 Marks)

Basic principles of parasitism: types of parasites, types of hosts. Mosquito and pathogenicity. Vector host interactions, stages of life cycles. Arbovirus: their types and infections in human being due to them. Epidemiology and diagnosis of yellow fever, Zika virus, dengue fever and Japanese encephalitis.

UNIT-IV (20 Marks)

Classification of Insect up to order with their characteristics features and examples. Characteristics of mosquitoes- *Anopheles* - *Culex* - *Aedes*- *Mansonia*. Characteristics of sand flies: *Phlebotomus* - *Sergentomyia*. Characteristics of flies: *Musca* - *Calliphora*.

UNIT-V (14 Marks)

Collection and preservation techniques of mosquitoes- sandflies- fleas- lice- ticks.

UNIT-VI (20 Marks)

Biodiversity Concepts and characteristics of biodiversity - Biodiversity hotspots - Biosphere - Species documentation- Diversity indices- Invasive species. Relationship between anthropogenic stressors- vector biodiversity. Natural enemies of arthropods: competitors-pathogens-parasites-parasitoids-predators-distribution and their role.

UNIT-VII (30 Marks)

Molecular taxonomy: Theory and practice of molecular taxonomy- Molecular techniques in mosquito taxonomy: RFLP- RAPD- Microsatellites- SNPs- Microarrays- DNA bar coding.

UNIT-VIII (30 Marks)

Anthroponotic diseases: disease vectors- mode of infection and transmission of Malaria, filariasis, visceral leishmaniasis, onchocerciasis, trypanosomiasis, Chagas disease, scrub typhus, tick typhus.

Zoonotic diseases: disease vectors - mode of infection and transmission of Cutaneous leishmaniasis, schistosomiasis, plague, Kyasanur Forest Disease (KFD), leptospirosis, dracunculiasis.

UNIT-IX (20 Marks)

Introduction to vector ecology and ecosystem- Habits and habitats- Species diversity- Food chain, food web, ecological niche, prey predator relationships- Interaction with biotic and abiotic factors- Dispersal and migration

PAPER – IV (TECHNICAL PAPER) - 200 marks

Applied Entomology and Immunology

UNIT- I (20 Marks)

Chemical communication, insect pest management, vector control methods. Parasites and parasitism. Distribution, habit and habitat, structure, life cycle and diseases caused by *Plasmodium*, *Entamoeba histolytica* and *Leishmania donovani*. Larval forms of Platyhelminthes and Nematelminthes. Distribution, habit and habitat, structure, life cycle and diseases caused by *Wuchereria bancrofti*.

UNIT- II (20 Marks)

Classification of insecticides and acaricides based on mode of entry, mode of action and chemical nature. Structure and mode of action of organochlorines, organophosphates, carbamates, pyrethroids. Types and mode of action of Biolarvicides, Insect growth regulators. Dosage and formulation of insecticides for vector control.

UNIT- III (20 Marks)

Detection and monitoring of vector insecticides resistance- Insecticide targets and mechanism of resistance. Enzymes involved in metabolism of xenobiotics (Mixed function oxidases (cytochrome P450), Esterases, Glutathione-S- transferases. Synergists and enzyme inhibitors.

UNIT – IV (40 Marks)

Malaria Clinical course and different clinical manifestations- Chemotherapy and general management of patients. Malaria control programmes and strategies. Diagnosis and morbidity management- Chemotherapy, chemoprophylaxis and selective treatment of Filariasis, Japanese encephalitis, Dengue, Chikungunya, Leishmaniasis. Tick borne diseases of public health importance - Kyasanur Forest Disease (KFD) - Typhus fever and Q fever- Case management – Prevention and control. Mite borne diseases Rickettsial diseases- Murine typhus and Rickettsial Diseases associated with rodents. Plague- Salmonellosis- Leptospirosis- chemotherapy and prevention and control.

UNIT – V (30 Marks)

Biology: Life cycle-mating, host seeking, feeding, resting, oviposition behavior, longevity, gonotrophic cycle, fecundity, survival and salient features of of Public Health Importance vectors- Mosquito (*Anopheles*, *Aedes*, *Culex*, *Mansonia*), Sand flies (*Phlebotomus*, *Sergentomyia*), Fleas, Bugs and Lice, Ticks and Mites.

UNIT- VI (40 Marks)

Immune system: Innate and acquired immunity; cells and organs of the immune system. Antigens: Antigenicity and immunogenicity; factors influencing immunogenicity, epitopes and haptens. Immunoglobulins: Structure, classes and function of immunoglobulins. Antibody Mediated effector functions; monoclonal antibodies, antibody engineering. Antigen- antibody interactions; generation of antibody diversity. Major histocompatibility complex in mouse and in human: MHC haplotypes; structure and functions of class-I and class-II MHC molecules. Major histocompatibility complexes, antigen processing and presentation. Interferons, Toll-like receptors, cell-mediated effector functions, inflammation, hypersensitivity and autoimmunity, immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections, congenital and acquired immunodeficiency.

UNIT- VII (30 Marks)

Complements: Features, classical and alternative pathways of complement activation. Cytokines and interferon: Major types, structure and functions. Hypersensitivity: Types and features; mechanism of immediate hypersensitive reactions; AIDS (Acquired immunodeficiency syndrome) – retrobiology. Role of T and NK cells in AIDS. Types of immune-diagnostics for vector borne diseases, Insect cell culture and its applications.

PAPER – V (TECHNICAL PAPER) - 200 marks

Biostatistics and Bio-Tools

UNIT – I (30 Marks)

Mean, median, mode. Sampling theory and sampling methods. Frequency distribution, tabulation, bar diagram, histograms, pie diagram, measures of skewness and kurtosis. Measures of dispersion: variance, standard deviation, standard error, coefficient of variation.

UNIT – II (20 Marks)

Experimental design. Binomial, Poisson and normal distribution. Hypothesis testing. Chi square and t- test. ANOVA. Correlation and regression analysis. Probit analysis: calculation of LC50 / LC90 values.

UNIT – III (40 Marks)

Phase contrast, fluorescence, Electron microscopy: scanning and transmission. Spectrophotometry and spectrofluorometry: principles and applications. Principle and types of electrophoresis: Agarose and polyacrylamide, determination of molecular weight, isoelectrofocussing and SDS-PAGE, pulse field gel electrophoresis. Immunological techniques – antigen and antibody preparation and purifications, immunodiffusion, immunoelectrophoresis.

UNIT – IV (50 Marks)

Polymerase chain reaction (PCR) and types. Blotting techniques: Northern, Southern, Western and South Western. Immuno-precipitation and Co-IP. Molecular phylogeny of vectors and parasites using molecular markers - RAPD - RFLP- AFLP and Microsatellites. Amplification of DNA by PCR- restriction endonucleases- ligation- transformation- restriction mapping of DNA fragments- construction of genomic and cDNA libraries and screening for genes of interest- site directed mutagenesis - preparation of radio labelled DNA and RNA probes for molecular diagnosis of parasites and vectors by Southern and Northern hybridization. DNA sequencing. DNA microarray. Transgenic mosquitoes.

UNIT-V (30 Marks)

Bioinformatics: Basic knowledge of computer aided biology, genome characteristics, databases- search and retrieval- sequence alignment and annotation- comparative genomics - principles of phylogenetic analysis and recovering evolutionary history. Proteomics- protein structure prediction and implications in bioinformatics.

UNIT-VI (30 Marks)

Immunological techniques: immunodiffusion, immunoaffinity, ELISA, agglutination, immunoprecipitation, immunoelectrophoresis, chimeric antibodies; antibody engineering; vaccinology- active and passive immunization; types of vaccines; vaccine technology- recombinant vaccines.
