

Mahatma Gandhi University
of
Medical Sciences & Technology, Jaipur

Syllabus

M.Sc. (Molecular Virology)

(2 Years Degree Course)

Notice

1. Amendments made by the University in Rules / Regulations of the Courses shall automatically apply.
2. The University reserves the right to make changes in the syllabus/books/ guidelines, feestructure or any other information at any time without prior notice. The decision of the University shall be binding on all.
3. The Jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.

M.Sc. (Molecular Virology)

(2 Years Degree Course)

Rules & Regulations

1. TITLE OF THE COURSE

The title of the course shall be “M.Sc. (Molecular Virology)”.

2. DURATION OF COURSE/TRAINING

The course shall be of two years duration from the date of commencement of academic session.

3. MEDIUM OF INSTRUCTION

English shall be the medium of instruction

4. ELIGIBILITY FOR ADMISSION:

Candidate should have passed the M.B.B.S. or Bachelor's Degree in Science with Biology/Microbiology/Biotechnology/Biochemistry as one of the main subjects.

5. CRITERIA FOR ADMISSION

Selection shall be done by an Admission Board of the University strictly on merit. It will consist of two-step process –Written Entrance Examination followed by Counseling/Personal Interview (PI).

6. RESERVATION POLICY

Reservation shall be applicable as per policy of the State Government.

7. ENROLMENT

Every candidate who is admitted to M.Sc. Course in Mahatma Gandhi Medical College & Hospital shall be required to get himself/herself enrolled with the Mahatma Gandhi University of Medical Sciences & Technology after paying the prescribed eligibility and enrolment fees.

A candidate shall deposit enrolment fees along with tuition fees at the time of his/her admission to the course. Such a candidate who fails to submit, through the college Principal, duly filled enrolment form along with original documents including migration certificate required for enrolment within two months of his/her admission or up to November 30 of the year of admission whichever is later, he/she will have to pay late fee prescribed by the University

8. MIGRATION RULES

No student, once admitted to the course and enrolled by the University, will be permitted to migrate to any other Course/ University.

No student will be admitted to the Course on migration from any other Course/ University.

9. ATTENDANCE

Minimum 75% attendance in each year, both for theory and practical classes separately. Student with deficient attendance will not be permitted to appear in University examination.

10. TRAINING:

1. The period of training for M.Sc. shall be of two years from the date of admission.
2. Part – I and Part – II of the course shall be of one-year duration each.
3. The candidate will undertake the post graduate training as a full time post graduate in the department concerned.
4. The students will be required to complete the prescribed period of study and fulfill the requirement of attendance before they are allowed to appear in the University examination.

11. EXAMINATION AND ASSESSMENT

1. The examination of Part I shall consist of three theory papers and internal assessment and practical & viva-voce examination.
2. The examination of Part II shall consist of three theory papers & internal assessment, practical and dissertation in the opted specialization.
3. A candidate shall be permitted a maximum of 4 years from the year of admission to complete the course and pass the examination failing which, the candidate will have to leave the course.
4. Only those candidates will be allowed to appear at Part II examination, who have passed Part –I examination completely.

12. CONDUCTION OF THE UNIVERSITY EXAMINATION:

University examination shall be conducted twice in a year; that is Main and Supplementary Examination. Supplementary examination shall be conducted after 2-4 months of the main examination.

13. SCHEME OF EXAMINATION

The Examination in Part I shall consist of:

Paper	Marks
Theory	
Paper I - Basic Microbiology, Virology and Immunology	100 Marks
Paper II -Epidemiology, Biostatistics and Entomology	100 Marks
Paper III - Basic and Applied Viral Genetics	100 Marks
Internal Assessment	100 Marks
Practical & Viva Voce Examination	300 Marks
Total Marks	700 Marks

Notes:

1. Each theory paper shall be of 3 hours duration.
2. Each paper will be set by the External Examiner of the subject concerned and will be assessed by the internal examiner of the subject concerned.

Pattern of questions to be set and answered shall be as follows:

Paper	No. of questions to be set	No. of questions to be answered
Paper I	4	4
Paper II	4	4
Paper III	4	4

3. In order to pass the University Examination, the candidate must secure a minimum of 50% marks in each theory paper, 50% marks in internal assessment and 50% marks in practical and viva-voce examination separately.
4. A candidate who has failed in one or more theory paper of Part-I Examination must appear in that theory paper in supplementary examination which will be conducted by university within 2 – 4 months.

The Examination of Part II shall consist of:

Paper	Marks
Theory	
Paper I - Diagnostic Virology	100 Marks
Paper II - Applied Epidemiology and Applied Entomology	100 Marks
Paper III - Recent Advances in Molecular Virology	100 Marks
Internal Assessment	100 Marks
Practical & Viva Voce Examination	300 Marks
Dissertation	100 Marks
Total Marks	800 Marks

Notes:

1. Each theory paper shall be of 3 hours duration.
2. All papers shall be set by the External Examiners.
3. Paper I will be assessed by the External Examiner and Paper II will be assessed by the Internal Examiner viz. Head of the Department of subject concerned. Paper III will be assessed by Professor / Associate professor / Assistant professor.

Pattern of questions to be set and answered shall be as follows:

Paper	No. of questions to be set	No. of questions to be answered
Paper I	4	4
Paper II	4	4
Paper III	4	4

4. Practical examination shall be conducted by one Internal, one External Examiner which will be appointed by the university.
5. In order to pass the University Examination, the candidate must secure a minimum of 50% marks in each theory paper, 50% marks in internal assessment , 50% marks in practical & viva-voce examination and 50% marks in dissertation separately.
6. In case a student passes either in Theory or in Practical only, the student shall be considered to fail in the whole examination and he will have to appear in both the Theory and Practical in the subsequent examination.
7. To successfully complete the course and pass the examination, a candidate shall be permitted a Maximum of four years from the date of his/her admission in the course, failing which he/she will have to leave the course.

14. APPOINTMENT OF EXAMINER AND PAPER SETTERS

- a. All the examiners, paper setters, theory examination answer books evaluators, Internal and External Examiners for Practical examinations shall be appointed by the President of the University.
- b. Qualification of the Paper setter / Examiner: Associate Professor and above.
- c. Paper setter can be an examiner

15. GRACE MARKS

No grace marks will be provided in M.Sc. Examination

16. REVALUATION / SCRUTINY

No Revaluation of answer books shall be permitted in M.Sc. Examination. However, the candidate can apply for scrutiny of marks as per University Rules.

SYLLABUS

M.Sc. (Molecular Virology)

(2 Years Degree Course)

Learning Objectives:

1. To enable the students to have the understanding on the basics of the learning of Virology.
2. To impart the knowledge regarding the diagnostics clinical aspects and related implications of human viral disease and newer emerging viral infections including the viral mutant forms for emerging.
3. The identification is very essential for all the three-line managements –primary, secondary and tertiary managements and hence the systematic training course for the graduates at the university level is found to be very essential and urgent need.

Assessment:

The examination to the first/second year shall be open to a student who: Has remained on the rolls of the course concerned for full on academic year preceding the examination and having attended not less than 75% of the full course of lectures and 75% practical separately held for the purpose in each year.

Distribution of Teaching hours

1st Year M.Sc. (Molecular Virology)

Name of the paper	Hours
Paper I- Basic Microbiology, Virology and Immunology	100
Paper-II – Epidemiology, Biostatistics and Entomology	100
Paper-III – Basic and Applied Viral Genetics	100
Total Theory Hours	300
Practical	400
Total Hours:	700

2nd Year M.Sc. (Molecular Virology)

Name of the paper	Hours
Paper I- Diagnostic Virology	100
Paper-II – Applied Epidemiology and Applied Entomology	100
Paper-III – Recent Advances in Molecular Virology	100
Total Theory Hours	300
Practical	400
Total Hours:	700

FIRST YEAR: Theory

PAPER I: Basic Microbiology, Virology and Immunology

Basic Microbiology

1. Microbiology
2. Sterilization and disinfection
3. Microscopy principles and applications

Basic Virology

1. Introduction

History and principles of virology, virus taxonomy, introduction to replication strategies.

Virus structure and morphology.

Infrastructure

Principles of bio-safety, contaminant facilities, maintenance and handling of laboratory animals and requirements of virological laboratory.

2. Virological Methods

Cultivation and purification of viruses

In vivo and in vitro systems for virus growth, estimation of yields, methods for purification of viruses with special emphasis on ultracentrifugation methods.

Diagnostic Methods

Immunodiagnosis, haemagglutination and haem agglutination – inhibition tests, Complement Fixation, Neutralisation, Western Blot, RIPA, flowcytometry and immunochemistry.

a) Nucleic acid based diagnosis

Nucleic acid hybridization, polymerase chain reaction, microarray and nucleotide sequencing.

b) Microscopic techniques

Fluorescence, confocal and electron microscopic techniques—principles and applications.

c) Analytical techniques

Electrophoresis, chromatography, membrane filtration, NMR, X-ray Crystallography.

3. Tissue Culture and Cell Biology

Cell structure

Structure and function of cellular organelles, cytoskeleton, cell division, biomembranes, cell adhesion and junctions.

Macromolecules

Structure and function of DNA, RNA, proteins, carbohydrates and lipids.

Molecular Biology

Replication of DNA, transcription and post-transcriptional modifications, protein biosynthesis, post-translational modifications.

Cell signalling

Signal transduction pathways

Tissue Culture methods

In-vitro cultures-primary, diploid and established cell lines, organ culture, cell types in culture. Cell environment- Nutritional requirements, substrates. Cell characterization- Karyotyping, growth rates, isoenzymes and differentiation- normal and transformed cells. Large scale production-suspension cultures, microcarriers, hollow fiber reactors, etc. Media, MEM, cell line maintenance, cultivation of viruses and interpretation of CPE.

Developmental Biology

Cell growth- Hyperplasia, hypertrophy, development and differentiation cell lineages, growth and differentiation factors. Stem cells- adult and embryonic.

Basic Immunology

1. Introduction to Immunology

Introduction and history of immunology, primary and secondary organs of immune system, cells of the immune system.

Innate immunity

Innate immune response, complement system.

Immunoglobulins

Antibody structure and function, Immunoglobulin classes.

Antigen recognition

Antibody diversity, major histocompatibility complex, ontogeny, positive and negative selection.

Acquired immune response

Antigen presenting cells, T cell stimulation, hypersensitivity.

Antiviral Immune response and hybridoma technology

Immune responses in various viral infections, generation of monoclonal antibodies- principles and applications.

2. Advanced Immunology ,Antigen Presentation

Secondary signalling, co-stimulation, cell signalling in immune response. DC activation, B cells as APC, experimental models in APC.

Molecular Immunology

Peptide epitopes T cell B cell antigenic properties, prediction of T and B cell epitopes, chimeric peptides, polytype vaccines Major Histocompatibility complex-1, polymorphism.

Effectors Mechanisms

Mucosal immunity, peyer's patches, gut barriers oral immunization oral tolerance cytotoxic response, ADCC, NK cells, CTL, Th, T reg, immunoregulation, anergy, tolerance, anti idiotypic, mechanisms of antiviral innate immune response, mechanisms of antiviral immune response, persistent infection (EBV, LCMV), experimental models in immunopathogenesis.

Immunological Diseases

Autoimmunity-mechanisms, altered antigens, systemic lupus erythematosus, Graves disease, rheumatoid arthritis, myasthenia gravis, multiple sclerosis, animal models of autoimmunity, transplantation immunology, GvH, immunodeficiency: phagocytic, humoral, CMI, combined HLA association with disease.

PAPER II – Epidemiology, Biostatistics and Entomology

Basic Epidemiology and Statistics

Introduction

Historical aspects and evolution of epidemiology, definitions and concepts in Epidemiology.

Approaches in Epidemiology

Descriptive and analytical epidemiology, disease burden, natural history of disease and measure of risk and death.

Study design and sampling

Sample size estimation and introduction to study design in epidemiological investigations.

Fundamentals in Biostatistics

Introduction, types of data, tabular and graphical presentation of data.

Measures of location, dispersion and correlation

Measures of central tendency. Mean, mode, median, GM, HM, quartiles.

Measures of Dispersion- range, standard deviation, variance, coefficient of variation.

Probability and Statistical Interference

Concept and probability distribution. Normal distribution- density curves, applications and statistical tables. Concept of significance tests, parametric and non- parametric tests, standard error and confidence intervals.

Medical Entomology

Insect Morphology, Collection and Preservation

Introduction to general entomology, insect morphology and classification of insects and other arthropods of medical importance and their structures and functions. Methods of collecting these insects and arthropods, their preservation, maintenance and transportation.

Biology and ecology of mosquitoes

Biology and life history of Aedes, Culex, and Anopheles, their behavior and ecology with special reference to Dengue, Chikungunya, Japanese Encephalitis, and West Nile.

Biology and ecology of other blood sucking insects, Ticks, Mites

Biology, morphology and disease relationship of sandflies (Sandfly fever and Chandipura).

Biology and morphology of Fleas, Lice, Culicoides. Biology, ecology, life history of ticks with special reference to Kyasanur Forest Disease (KFD). Biology and morphology of mites.

PAPER III – Basic and Applied Viral Genetics

Gene Regulation and Recombinant DNA based technology

Prokaryotic gene expression

Polymerase- promoter interactions, control of transcription initiation and termination

Eukaryotic gene expression

Chromosomes, chromatin structure, regulatory elements, splicing and RNA processing.

Virus Replication

RNA Viruses:

General strategies, replication of plus stranded RNA virus (polio), negative strand RNA viruses (VSV and Influenza)

Other RNA Viruses

Replication of double stranded RNA virus (Rota), ambisense RNA (LCM) and retroviruses (HIV and HTLV).

DNA viruses

Replication of double stranded DNA viruses (SV40, Pox), ssDNA Virus (AAV)

Miscellaneous

Prion proteins

SECOND YEAR : Theory

PAPER I :Diagnostic Virology

Perspectives of Viral Diarrhoea

Clinical course, disease burden, risk factors, epidemiology, prevention, and treatment. Rotavirus diversity, emerging strains, immunopathogenesis and vaccines under development. Other viruses associated with diarrhoea and gastroenteritis: Adenoviruses, Astroviruses, Norwalk and Sapporo-like viruses and Enteroviruses. Other Enteroviral diseases.

Viral Cancers

Role of papilloma HIV, Epstein Barr virus, HTLV and herpes in pathogenesis of cancers, diagnosis, prevention

Respiratory diseases of Viral Etiology

Origin and evolution of viral respiratory diseases

History, clinical features, epidemiology of influenza, RSV and other respiratory diseases

Biology of respiratory viruses

Biology and pathogenesis of SARS, human rhino virus and Corona virus etc,

Diagnostics

Differential diagnosis of different respiratory diseases.

Vaccines: Vaccines against different viral respiratory diseases

Exanthematous Diseases of Viral Aetiology

Measles and SSPE

Clinical features, disease burden, case definition and associated risk factor, strategies for prevention and treatment, biology and immunopathogenesis

Rubella, CRS, Mumps and Poxviruses

Clinical features, disease burden of Rubella, CRS and mumps, case definition and risk factors. Preventive and therapeutic modalities.

Pathogenesis of disease. Clinical aspects of Parvovirus B-19

Pox diseases

Common features of viral pox diseases and case definitions. Paraspecific immunity due to pox vaccination, eradication and control programs.

Viral Haemorrhagic Fevers

Clinical course of viral infections

Common clinical features of haemorrhagic fevers, History and Disease Burden, risk factors and geographical distribution of viruses associated with haemorrhagic fevers and their impact on global health. Clinical samples required, choice of laboratory diagnostic tests and their interpretation for differential diagnosis.

Dengue and DHF

Virus replication strategy, Pathogenesis, Prevention and treatment of Dengue Role of humoral and cell mediated immunity and viral factors in development of DHF, differential diagnosis of DF and DHF on the basis of clinical symptoms.

Haemorrhagic manifestations caused by other viruses

Virus replication strategy, Pathogenesis, Prevention and treatment of Yellow fever, KFD, Chikungunya and Ebola. Development of killed KFD vaccine.

HIV/AIDS

Natural history of AIDS

Global epidemiology of HIV, epidemiology of HIV in India. Sexually transmitted diseases and their relation with HIV, opportunistic infections in HIV infected individuals. Social and behavioral aspects of prevention and control.

Natural history.

Biology of HIV and its detection

Structure and replication of HIV, immunopathogenesis of infection, laboratory diagnosis of HIV infection, HIV isolation, characterization and viral estimation.

Preventive and therapeutic approaches

Viral Encephalitis

Overview

Viral Encephalitis, encephalopathy and meningitis clinical symptoms and causative agents, treatment modalities, transmission, spread of the outbreak in relation to causative agent. Laboratory diagnosis of viral encephalitic agents, basic principles, preferred methods and problems

JE, WN CHP

Japanese encephalitis and West Nile viral infections, endemic areas, disease burden, seasonality, role of non human hosts, genotypes vaccines Chandipura encephalitis, endemic areas, disease burden, seasonality, role of non human hosts, genotypes, other rhabdoviral neurotropic agent

Other viruses

Encephalitis/encephalopathy caused by measles virus.

Pathogenesis

Routes and modalities of infections of the nervous tissue, blood brain barrier, factors affecting the neurovirulence, Animal models and vaccine potency testing.

Viral Hepatitis

Clinical presentation & epidemiology of viral hepatitis

Physiology of Jaundice, clinical features and differential diagnosis, presentations of hepatitis caused by different hepatitis viruses.

Structure & genomic organization

Structure & genomic organization, replication, genotypes, serotypes of HAV, HBV, HCV, & HEV. Mutations in hepatitis viruses.

Diagnostics

Serological and molecular diagnosis of different hepatitis viruses.

Immunopathogenesis

Immunopathogenesis of different hepatitis viruses.

Prevention & therapeutic approaches

Historical aspects, types of hepatitis vaccines, vaccines presently used & vaccines of the future. Vaccination as preventive measure in public health.
Therapeutic possibilities of the present and future.

PAPER II: Applied Epidemiology and Applied Entomology

Applied Epidemiology

Public Health Surveillance

Types and methods of public health and infectious disease surveillance, establishing surveillance system.

Analytical Epidemiology

Case control and cohort studies

Outbreak Investigations

Needs and steps to be taken for outbreak investigations, collaboration with state and national health authorities.

Applied Entomology

Vector Virus Relationship

Virus dissemination & mechanism of virus transmission in vectors, natural cycle, maintenance of viruses in nature, basis of vector competence, mechanical transmission, virus dissemination, susceptibility- intrinsic and extrinsic factors. Xenodiagnosis- methods and applications.

Epizootiology of Vector Borne Viral Diseases

Formation of natural foci of diseases, spatial structure and geographic variations. Animal movements, host preferences of vectors and their influence, influence of man in natural locality, natural cycles and population biology of vector borne pathogens, GIS in vector borne viral diseases.

Vector Control

Various control strategies and environmental management. Control in urban settings. Control at aquatic stages, adult population, personal protection and insecticide resistance mechanism and control dynamics.

Molecular Entomology

Mosquito Genetics
Transgenic vectors

Molecular characterization of vectors: Species complexes, molecular approach to Taxonomy, proteins as Taxonomic markers, biochemical and molecular taxonomy for detection of intra-species variation.

PAPER III: Recent Advances in Molecular Virology

Bioinformatics

Introduction and Biological Databases

Nucleic Acids, proteins, genomes- Structure data bases, search engines, sequence data forms and submission tools, scoring matrices for sequence alignments, algorithms- pairwise sequence alignments, database similarity searches- BLAST, FASTA

Methods for sequence analysis

Multiple sequence alignment, phylogenetic analysis and tree building methods, motif searches, epitope prediction, data mining tools and applications, promoter and gene prediction, comparative analysis.

Advanced Molecular Techniques

1. RFLP
2. Sequencing-basic
3. Sequencing-methodology and its application
4. Microarrays

Introduction to Nano Technology

Overview / Application

Antivirals and viral vaccines

Viral Vaccines

Conventional vaccines- killed and attenuated, modern vaccines recombinant proteins, subunits, DNA vaccines, peptides, immunomodulators (cytokines), vaccine delivery and adjuvants, large scale manufacturing- QA/QC issues

Antivirals

Interferons, designing and screening of antivirals, mechanism of action, antiviral libraries, antiretrovirals- mechanism of action and drug resistance.

Modern approaches of virus control

Anti-sense RNA, siRNA, ribozymes. Assignments, group discussions and presentations.

FIRST YEAR : Practical

1. Microscopy
2. Glassware Decontamination, Washing, Sterilization, Packing & Sterile handling
3. Media & Reagents Preparation, Sterility Checks
4. Sample Collection & Processing
5. Routes of Inoculations in Embryonated Eggs
6. ELISA
7. Serodiagnosis of HCV
8. Serodiagnosis of HBV
9. Serodiagnosis of HIV

SECOND YEAR : Practical

1. Nucleic Acid Extraction
2. Detection of DNA & RNA
3. Estimation of DNA & RNA
4. PCR
5. Real Time PCR
6. Identification of PCR Amplified Products of Viral Antigens
7. ELISA
8. Chemo luminescenceImmuno Assay
9. Rapid Diagnostic tests eg. HIV, HBsAg , Anti-HCV
10. Sample Collection & Processing
11. Routes of Inoculations in Embryonated Eggs
12. BLAST
13. FASTA
14. Data mining tools

DISSERTATION / PROJECT WORK

- a) All candidates admitted to undergo M.Sc(Molecular Virology) course shall be assigned a topic for dissertation / Thesis by the allotted guide and the title of the topics assigned to the candidates be intimated to the Controller of Examinations of this University by the Head of the Department through the Head of the Institution after 6 months of admission and before the end of 1st year of the course.
- b) The Dissertation / Thesis shall be conducted under the supervision of an allotted guide of the opted subject. The work shall relate to the lab investigations and quality management of the specialisation area.
- c) The candidate shall submit the Dissertation / Thesis as a printed copy to the Head of Department at least one month before commencement of University Theory paper (Part-II) examination otherwise permission to appear in the University examination shall not be granted. The same shall be presented and assessed at the time of Examination.

REFERENCE BOOKS-

1. Microbiology : Gerard J Tortora and Berdell R Funke and Christine L Case, Pearson (latest edition)
2. Prescott's Microbiology : Joanne Willey and Linda Sherwood and Chris Woolverton, McGraw Hill (latest edition)
3. Fields Virology Vol 1 and 2. B.N. Fields, D.M. Knipe, P.M. Howley, R.M. Chanock, J.L. Melnick, T.P. Monath, B. Roizman, and S.E. Straus, eds.), (latest edition) . LippincottRaven, Philadelphia, PA.
4. Principles of Virology: Molecular Biology, Pathogenesis, and Control of Animal Viruses. S. J. Flint, V. R. Racaniello, L. W. Enquist, V. R. Rancaniello, A. M. Skalka. Latest edition / Pub. Date: December 2003 Publisher: American Society MicrobiologyChapters 313
5. Fundamentals of Molecular Virology: Nicholas H. -Wiley publishers.
6. Basic virology: Edward K. Wagner & Martinez J. Hewlett. Blackwell publishers.
7. Immunology. Ivan Roitt, Jonathan Brostoff, David Male, David K. Male (Editor). Latest edition. Publisher: Elsevier Health Sciences.
8. Immunology. David A. Goldsby, Janis Kubly, Thomas J. Kindt, Barbara A. Osborne Latest edition. Publisher: W. H. Freeman Company.
9. Epidemiology: An Introduction. Kenneth J. J. Rothman. Latest edition. Publisher: Oxford University Press.
10. Epidemiology. Leon Gordis. Latest edition / Pub. Date: November 2004. Publisher: Elsevier Health Sciences.
11. Basic and Clinical Biostatistics. Beth Dawson, Robert G. Trapp, Robert Trapp. Latest edition.
12. Discovering Statistics Using SPSS. Andy Field. Latest edition. Publisher: SAGE Publications.
13. Fundamentals of Epidemiology and Biostatistics: Shyam Sunder Deepti (latest edition)
14. Gordon RM, Lavoipierre MMJ. Entomology for students of Medicine. Blackwell Scientific Publ. (latest edition)
15. Service MW. Medical entomology for students. Chapman and Hall (latest edition)
16. The Science of Genetics : by Alan G. Atherly, Jack R. Girton, John F. McDonald (latest edition)
17. Genetics : P.S. Verma & V.K. Agarwal (latest edition)
18. Koneman's Color Atlas and Textbook of Diagnostic Microbiology (latest edition)
19. Clinical Virology - Richmans Hayden (latest edition)
20. Introduction to Bioinformatics Lesk, A. (latest edition)

MODEL PAPER

M.Sc. (Mol. Virology)– I

Short Name

M.Sc. (Molecular Virology)Part-I (Main) Examination month year

Paper I

Basic Microbiology, Virology and Immunology

Time: Three Hours

Maximum Marks: 100

Students shall be allowed to take only one supplementary copy long with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answer at different places in the answer book

Attempt all Questions.

- | | | |
|-----|---|--------|
| Q.1 | Define sterilization and disinfection. Enumerate the methods of sterilization and disinfection. Write in detail about the moist heat sterilization. | 25 |
| Q.2 | Discuss the laboratory tests for viral diagnosis. | 25 |
| Q.3 | Write in brief about | |
| | a) Cell mediated immune response with examples | 12½ |
| | b) Autoimmune diseases | 12½ |
| Q.4 | Short Notes | 5x5=25 |
| | a) Post translational modifications | |
| | b) Major histocompatibility complex | |
| | c) Hypersensitivity | |
| | d) Principle and application of monoclonal antibodies | |
| | e) Cell signalling | |

MODEL PAPER

M.Sc. (Mol. Virology)– I

Short Name

M.Sc. (Molecular Virology) Part-I (Main) Examination month year

Paper-II

Epidemiology, Biostatistics and Entomology

Time: Three Hours

Maximum Marks: 100

Students shall be allowed to take only one supplementary copy long with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answer at different places in the answer book

Attempt all Questions.

- | | | |
|-----|---|--------|
| Q.1 | Give an account of blood sucking insects of medical importance. | 25 |
| Q.2 | Discuss the male reproductive system of insect. | 25 |
| Q.3 | Write in brief about | |
| | a) Collection, preservation and maintenance of insects. | 12½ |
| | b) Measure of Dispersion | 12½ |
| Q.4 | Short Notes | 5x5=25 |
| | a) Dengue | |
| | b) Disease burden | |
| | c) Median | |
| | d) Life history of Anopheles | |
| | e) Biology and morphology of mites | |

MODEL PAPER

M.Sc. (Mol. Virology)– I

Short Name

M.Sc. (Molecular Virology)Part-I (Main) Examination month year

**Paper-III
Basic and Applied Viral Genetics**

Time: Three Hours

Maximum Marks: 100

Students shall be allowed to take only one supplementary copy long with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answer at different places in the answer book

Attempt all Questions.

- | | | |
|-----|--|--------|
| Q.1 | Explain the gene expression in eukaryotes in detail. | 25 |
| Q.2 | Discuss the replication of RNA viruses. | 25 |
| Q.3 | Write in brief about | |
| | a) Gene expression in prokaryotes. | 12½ |
| | b) Enzymes involved in DNA replication. | 12½ |
| Q.4 | Short Notes | 5x5=25 |
| | a) Prion proteins | |
| | b) Splicing and RNA processing | |
| | c) Replication of DNA viruses | |
| | d) Promoters | |
| | e) Chromatin structure | |

MODEL PAPER

M.Sc. (Mol. Virology)– II

Short Name

M.Sc. (Molecular Virology) Part-II (Main) Examination month year

Paper I
Diagnostic Virology

Time: Three Hours

Maximum Marks: 100

Students shall be allowed to take only one supplementary copy long with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answer at different places in the answer book

Attempt all Questions.

- Q.1 Classify Retroviruses. Describe the morphology, antigenic variation and discuss the laboratory diagnosis of HIV infection. 25
- Q.2 Explain the differential diagnosis of different respiratory diseases. 25
- Q.3 Write in brief about
- a) Serological and molecular diagnosis of different Hepatitis. 12½
 - b) Vaccine for hepatitis. 12½
- Q.4 Short Notes 5x5=25
- a) Viral encephalitis
 - b) Pox diseases
 - c) Yellow fever
 - d) Herpes in pathogenesis of cancer
 - e) Corona virus

MODEL PAPER

M.Sc. (Mol. Virology)– II

Short Name

M.Sc. (Molecular Virology) Part-II (Main) Examination month year

Paper-II

Applied Epidemiology and Applied Entomology

Time: Three Hours

Maximum Marks: 100

Students shall be allowed to take only one supplementary copy long with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answer at different places in the answer book

Attempt all Questions.

- | | | |
|-----|--|--------|
| Q.1 | Explain in detail about the virus dissemination and vector-virus relationship. | 25 |
| Q.2 | Write a detailed note on various control strategies of vector in urban settings. | 25 |
| Q.3 | Write in brief about | |
| | a) Insecticide resistance mechanism | 12½ |
| | b) Xenodiagnosis – methods & applications | 12½ |
| Q.4 | Short Notes | 5x5=25 |
| | a) Infectious disease surveillance | |
| | b) Types & methods of public health | |
| | c) Transgenic vectors | |
| | d) Molecular characterization of vectors | |
| | e) Vector borne viral diseases | |

MODEL PAPER

M.Sc. (Mol. Virology)– II

Short Name

M.Sc. (Molecular Virology) Part-II (Main) Examination month year

Paper-III

Recent Advances in Molecular Virology

Time: Three Hours

Maximum Marks: 100

Students shall be allowed to take only one supplementary copy long with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answer at different places in the answer book

Attempt all Questions.

- | | | |
|-----|---|--------|
| Q.1 | Discuss the importance of biological databases in bioinformatics. | 25 |
| Q.2 | Define interferons. Explain in detail about the antiviral actions of interferons. | 25 |
| Q.3 | Write in brief about | |
| | a) Viral vaccines and its types | 12½ |
| | b) RFLP | 12½ |
| Q.4 | Short Notes | 5x5=25 |
| | a) Datamining tools and its applications | |
| | b) Nanotechnology and its applications | |
| | c) Microarrays | |
| | d) BLAST and FASTA | |
| | e) DNA vaccines | |