GUIDELINES FOR B. Sc. MICROBIOLOGY
DEGREE COURSE
(NON-MEDICAL COURSE UNDER BASIC MEDICAL SCIENCES)
(3 YEARS +1 YEAR INTERNSHIP)

TEACHING FACULTY:

DESIGNATION	**NO. OFPOST REQUIRED**	**MINIMUM QUALIFICATION**	**TEACHING EXPERIENCE (IN YEARS)**
COURSE DIRECTOR (OR) PROFESSOR	1	M.D. (MICROBIOLOGY)	10 YEARS TEACHING EXPERIENCE IN MICOBIOLOGY
ASSOCIATE PROFESSOR	1	M.D. (MICROBIOLOGY)	5 – 8 YEAR TEACHING EXPERIENCE IN MICROBIOLOGY
ASSISTANT PROFESSOR	3	M.D. (MICROBIOLOGY)	0 – 3 YEARS TEACHING EXPERIENCE
PART TIME LECTURERS		ENGLISH & COMPUTER SCIENCES	

ADMINISTRATIVE STAFF

DESIGNATION	**NO. OF POST REQUIRED**
ADMINISTRATIVE OFFICER	YES
CLERK	YES
STAFF NURSE	-
COMPUTER OPERSTOR	YES
ACCOUNTANT	YES
LIBRARIAN	YES
LABORATORY / SKILLS LAB	YES

PARTICULARS	**PER DAY**	**PER WEEK**	**PER MONTH**

OUTPATIENTS	-	-	-
IN PATIENTS	-	-	-
BED STRENGTH			

PARTICULARS	**REQUIREMENTS**
EQUIPMENTS	
MULTI MEIDA	YES

PARTICULARS	**NO. OF ROOMS**	**SQ.FT.**
1. Class Room	Yes	
2. patients preparation Room	Yes	
3. Administrative officer	Yes	
4. Professor room	Yes	
5. Assistant Professor	Yes	
6. P.G. Room	Yes	
7. Examination Rooms	Yes	
8. Op registration	Yes	
9. Waiting Hall	Yes	
10.Counseling Room	Yes	
11. Lab	Yes	
12. Clinical Demonstration	Yes	
13. Op – Procedure Room	Yes	
14. Staff Nurse Room	Yes	
15. Store Room	Yes	
16. Record + computer	Yes	

Room		
17. Follow up clinic (Old cases)	Yes	
18. Emergency Treatment Room	Yes	
19. Rest Room (Toilet)	Yes	
20. Day care chemo	Yes	

PARTICULARS	**REQUIREMENTS**
MAXIMUM INTAKE OF STUDENTS	20 PER YEAR
REGISTRATION DETAILS	AS PER UNIVERSITY NORMS.

(NON-MEDICAL COURSE UNDER BASIC MEDICAL SCIENCES)

(3 YEARS +1 YEAR INTERNSHIP)

Course Curriculum

Year	Paper	Name of the Paper	Marks
I	I (Theory)	Bacteriology	100
	II (Theory)	Virology	100
	III (Theory)	Mycology and Parasitology	100
	IV (Theory)	*I.E. English and Computer Science	100
II	I (Theory)	Cell Biology and Molecular Biology	100
	II (Theory)	Immunology and Hematology	100
	III (Theory)	Biochemistry	100
	IV (Theory)	Diagnostic Microbiology	100
III	I (Theory)	Diagnostic Virology	100
	II (Theory)	Medical Entomology	100
	III (Theory)	Epidemiology, Biostatistics and Bioinformatics.	100
	XVI (Theory)	*I.E. Bioinstrumentation and GLPs	100

* I.E. – Institution will conduct the Exam and send the marks to the University.

B.Sc. MICROBIOLOGY DEGREE COURSE
(NON-MEDICAL COURSE UNDER BASIC MEDICAL SCIENCES)
(3 YEARS +1 YEAR INTERNSHIP)

SCHEME OF EXAMINATION

FIRST YEAR
(240 Working days)

Paper No.	Subject Title	I A		Theory		Practical		Viva Voce	
						Common for Paper I,II & III			
		Max	Min	Max	Min	Max	Min	Max	Min
I.	Bacteriology	50	25	100	50	100	50	50	25
II.	Virology	50	25	100	50				
III.	Mycology and Parasitology	50	25	100	50				

Internal Papers:

Paper No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Ma x	Min	Max	Min	Max	Min
I.	English & Computer Science	50	25	100	50	100	50	50	25

* I.E. – Institution will conduct the Exam and send the marks to the University.

SECOND YEAR

(240 Working days)

Paper No.	Subject Title	I A		Theory		Practical		Viva Voce	
						Common for Paper I,II,III & IV			
		Max	Min	Max	Min	Max	Min	Max	Min
I.	Cell Biology and Molecular Biology	50	25	100	50	100	50	50	25
II.	Immunology and Hematology	50	25	100	50				
III.	Biochemistry	50	25	100	50				
IV.	Diagnostic Microbiology	50	25	100	50				

THIRD YEAR

(240 Working days)

Paper No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
I.	Diagnostic Virology	50	25	100	50	100	50	50	25
II.	Medical Entomology	50	25	100	50				
III.	Epidemiology and Biostatistics	50	25	100	50				

Internal Papers:

Paper No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
I.	Bioinstrumentation and GLP's	50	25	100	50	–	–	–	–

* I.E. – Institution will conduct the Exam and send the marks to the University.

FIRST YEAR

Paper I – Bacteriology

Microscopy: Principles and applications of simple, compound, bright field, dark field, phase contrast, fluorescent, confocal and electron microscopy (SEM, TEM and STEM).

Sterilization: Principles and methods - physical (moist heat, dry heat, filtration, pasteurization, tyndallization, radiations) and chemical (alcohols, aldehydes, phenols, halogens and hypochlorites). Laboratory of biosafety procedures, laboratory planning, recording of specimens, maintenance of laboratory records, cataloguing.

Bacteria : Difference between the prokaryotic and eukaryotic microorganisms. Ultrastructure of bacteria, subcellular structures and cell wall - slime, capsule, cell wall, pili, flagella, cell inclusions, biosynthesis of bacterial cell wall, cell membrane - liposomes - membrane transport - diffusion, active and passive transport and osmoregulation – metabolism.

Classification and characterization of bacteria according to Bergey's Manual of Systematic Bacteriology (9th edition). General characteristics and nature of Archaebacteria, Eubacteria, Cyanobacteria, Mycoplasmas, Rickettsiae, Chlamydias, Spirochaetes, Actinomycetes,

Culture techniques: Types of media simple, defined, enriched and transport media with specific examples for each type and their preparation. Methods of maintenance and preservation of microbes and cultures.

Principles of staining: Nature of dyes, types of staining - simple, differential, negative and spore staining.

Study of Staphylococcus, Streptococcus, Pneumococcus, *Neisseira gonorrhoea, Neisseira meningitis, Cornybacterium diptheriae, Mycobaterium, Clostridium, E.coli, H.pylori, Klebsiella, Salmonella, Proteus, Pseudomonas, Vibrio & Spirochaetes* with reference to their morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused and lab diagnosis.

Paper II – Virology

Viruses: History and principles of virology, virus taxonomy and nomenclature; Viral replication strategies. Virus structure, morphology, transmission and functions.

In vivo and in vitro systems for virus growth, estimation of yields, methods for purification of viruses

Viral Transcription 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, defective infectious particles and viroids, viruses and cancer

Cellular receptors and virus entry.
Definition, structure and methods of discovery of viral receptors (polio, herpes, VSV, HIV). Kinetics of receptor binding. Cellular interactions—clathrin coated pits, lipid rafts, caveolae, endocytosis and virus uncoating mechanisms Nuclear localization signals and nuclear pore transit, virus -cytoskeletal interactions, chaperons.

Virus morphogenesis.
Replication sites and their characterization, IRES, replicones, transport of viral proteins.

Antiviral agents and resistance

Mechanism of host cell damage
Host cell 'shut off', apoptosis, necrosis, stress response, alteration of signaling pathways, cellular basis of transformation, types of cenotaphic effects, ultrastructural cytopathology.

Cellular gene expression
Cellular injury associated markers, mechanism of viral persistence and latency—in vivo and in vitro models (JE, measles, LCM and HIV).

Antivirals and viral vaccines
Viral Vaccines

Conventional vaccines- killed and attenuated, modern vaccines recombinant proteins, subunits, DNA vaccines, peptides, immunemodulators (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.

Practical

1. Microscopy
2. Glassware Decontamination, Washing, Sterilization, Packing & Sterile Handling
3. Media & Reagents Preparation, Sterility Checks
4. Inoculation techniques
5. Culture techniques – aerobic and anaerobic
6. Staining methods- preparation of stains and staining procedures, simple stains, gram stain, acid fast stain (Ziehl Neelson's), capsular stain etc.
7. Colony count
8. Water bacteriology, coliform count
9. Preparation of swabs/sterile tubes & bottles.
10. Preparation of smear
11. Sterilization methods
12. Antibiotic sensitivity tests
13. Transport and preservation of microbes and cultures
14. Freezing & Revival of Cell Lines
15. Routes of Inoculations in Embryonated Eggs

Paper III – Mycology and Parasitology

Mycology: Introduction to fungi, taxonomy, fungal cell wall, hyphae, mycelia structures, spores, toxins, enzymes- nutritional requirements- yeasts-moulds and dimorphic fungi

Medical significance of fungi belonging to Divisions – Phyla - Chytridiomycotina, Glomeromycota, Zygomycota, Basidiomycota, Ascomycota, Microsporidia, Neocallimastigomycota

Mycotoxicology

Fungal infections (superficial, subcutaneous and systemic) and immunity - dermatophytosis- invasive fungal infections -

Lab diagnosis and treatment of fungal infections
Antifungal agents and their mechanisms - resistance to antifungal agents

Parasitology: Definition – parastism, HOST, Vectors etc, Classification of Parasites, Phylum Protozoa- general Pathogenic and non pathogenic protozoa. Phylum Nemathelminths/Round words (Nematoda), Phylum Platyhelminths – class-Cestoda, class-Trematoda, Lab diagnosis of parasitic infections.

Protozoa : Intestinal protozoa, Amoebae, E. Histolytica : Life cycle, Morphology, Disease & Lab diagnosis; blood protozoa

Flagellates of intestine/genitalia- Giardia lamblia : Life cycle, Morphology, Disease & Lab Diagnosis- Trichomonas vaginalis : Life cycle, Morphology, Disease & Lab Diagnosis-

Malarial Parasite: *Plasmodium vivax, P. malaria, P. falcipaum and P.ovale*: Life cycle, Morphology, disease & lab diagnosis - differences between malarial parasites

Nematodes: Intestinal Nematodes **:**Ascaris : Life cycle, Morphology, disease & lab diagnosis – Enterobius vermicularis (Thread worm) and Ancylostoma duodenale (Hook worm) Tissue Nematodes : W. Bancrofti – Life cycle, Morphology, Disease, cultivation & Lab Diagnosis

Phylum Platyhelminths: Cestodes – *T. solium, T. saginata & E. granulosus. Trematodes – S. haematobium & F. hepatica*.

Practical

1. Microscopic Examination of filamentous fungi and yeast
2. Staining-lactophenol cotton blue staining, gram's staining
3. KOH mount, skin scrapping, cultivation
4. Preparation of Sabouraud's medium with and without antibiotics
5. Identification, sensitivity tests for antifungal agents
6. Stool examination for parasitic infections
7. Identification of different ova & cysts in stool samples.

ENGLISH

Role of communication
Defining Communication
Classification of communication
Purpose of communication
Major difficulties in communication
Barriers to communication
Characteristics of successful communication - The seven Cs
Communication at the work place
Human needs and communication "Mind mapping"
Information communication

Comprehension passage:

Reading purposefully
Understanding what is read
Drawing conclusion
Finding and analysis

Explaining:-

How to explain clearly
Defining and giving reasons
Explaining differences
Explaining procedures
Giving directions

Writing business letters:-

How to construct correctly
Formal language
Address
Salutation
Body
Conclusion

Report writing:

Reporting an accident
Reporting what happened at a session
Reporting what happened at a meeting

BASICS OF COMPUTER

COURSE CONTENT:

Introduction to computer - I/O devices - memories - RAM and ROM - Different kinds of ROM -kilobytes. MB, GB their conversions - large computer - Medium, Micro, Mini computers - Different computer languages - Number system - Binary and decimal conversions - Different operating system - MS DOS - Basic commands - MD, CD, DIR,TYPE and COPY CON commands - Networking - LAN, WAN,MAN (only basic ideas)

Typing text in MS word - Manipulating text - Formatting the text - using different font sizes, bold, italics - Bullets and numbering - Pictures, file insertion - Aligning the text and justify - choosing paper size - adjusting margins - Header and footer, inserting page No's in a document - Printing a file with options - Using spell check and grammar - Find and replace - Mail merge - inserting tables in a document.

Creating table in MS-Excel - Cell editing - Using formulas and functions - Manipulating data with excel - Using sort function to sort numbers and alphabets- Drawing graphs and charts using data in excel - Auto formatting - Inserting data from other worksheets.

Preparing new slides using MS-POWERPOINT - Inserting slides - slide transition and animation - Using templates - Different text and font sizes - slides with sounds - Inserting clip arts, pictures, tables and graphs - Presentation using wizards.

Introduction to Internet - Using search engine - Google search - Exploring the next using Internet Explorer and Navigator - Uploading and Download of files and images - E-mail ID creation - Sending messages - Attaching files in E-mail - Introduction to "C" language - Different variables, declaration, usage - writing small programs using functions and sub - functions.

PRACTICAL

Typing a text and aligning the text with different formats using MS-Word

Inserting a table with proper alignment and using MS-Word

Create mail merge document using MS-word to prepare greetings for 10 friends

Preparing a slide show with transition, animation and sound effect using MS-Power point

Customizing the slide show and inserting pictures and tables in the slides using MS power point

Creating a worksheet using MS-Excel with data and sue of functions

Using MS-Excel prepare a worksheet with text, date time and data

Preparing a chart and pie diagrams using MS-Excel

Using Internet for searching, uploading files, downloading files creating e-mail ID

Using C language writing programs using functions

SECOND YEAR

Paper I – Cell Biology and Molecular Biology

Cell Biology: *Cell structure,* Structure and function of cellular organelles, cytoskeleton, cell division, Events in Mitosis and Meiosis- biomembranes, cell adhesion and junctions. *Cell signaling:* Signal transduction pathways

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

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

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.

Gene transfer mechanisms-Transformation - competence cells, regulation, general process; Transduction - general and specialized; Conjugation - Hfr, triparental mating, self transmissible and mobilizable plasmids, pili.

Transposable elements – Introduction – Discovery insertion sequences, complex and compound transposons-- T10, T5, and retroposon - Nomenclature- Insertion sequences - Mechanism - Transposons of E.coli, Bacteriophage and Yeast.

Paper II – Immunology and Hematology

Immunology

Immunity – Definition and classification– General Principles of Innate & Acquired Immunity.
Immune Response – Humoral immunity & cell mediated immunity.
Antigen – Definition, classes, properties.
Antibodies/Immunoglobulins – Definition, Properties, Sub types of Immunoglubulins
Antigen/Antibody Reaction/Serological Refractions –
Features of antigen/antibody Reaction– Precipitation– Agglutination– Complement fixation test – Neutralization– Opsonization– Immune adherence– Immuno fluorescence– Immuno electron Microscopic test
Structure and functions of Immune System – Parts of Immune system – T/B cells, other cells & their functions
Hyper sensitivity Reactions – General Principles of different types of hypersensitive reactions.
Auto immune disorders
Immunological diagnostic methods: Immunoassays, ELISA, IFA, Western blotting, immunostaining methods, Immunohistochemistry etc.
Vaccines & Sera: Bacterial and viral vaccines–prophylactic, therapeutic - Immunoglobulins–specific and non specific, toxin and toxoid, Antisera, antitoxins

Hematology

Blood–various components and their functions–collection of blood–coagulation of blood, anticoagulants, importance of blood clotting, factors involved in blood clotting.

Principle, procedures and significance of CT, BT, ESR, PCV, Haemoglobin, total count, differential count, reticulocyte count, absolute Eosinophil count

RBC–Development of RBC, enumeration of RBC, fragility of RBC, anemia, different types of anemia, bone marrow smear, recognition of normal bone marrow cells.

WBC–development, enumeration of WBC count, leukemia, different types, preparation of blood smear, Leishman's stain– thin smear and thick smear - technique of staining

Platelets–development– count– direct and indirect–causes of thrombocytopenia
Peripheral blood picture

Basic Hematological Techniques:

Preparation of specimen collection material.
Collection of blood specimen : various methods of collection.

Haemolysis of blood.
Separation of serum.
Separation of plasma.
Changes in blood on Keeping.
Maintenance of specimen identification.
Transport of the specimen.
Effect of storage on Blood Cell morphology.
Blood group system, Blood grouping, Rh typing & cross matching

Haematological tests:

WIDAL Test, VDRL Test, RA Test, CRP Test, Pregnancy Test & HIV Test, HA and HAI tests

Practical

1. PCR
2. Characterization of plasmid DNA by agarose gel electrophoresis.
3. Protein separation by Native PAGE and SDS PAGE
4. Collection of venous blood from human and separation and preservation of serum/plasma
5. Counter immuno electrophoresis
6. Blood grouping & Rh typing
7. Cross matching
8. Latex agglutination test
9. Widal tube and slide agglutination technique
10. Enzyme Linked Immunosorbent Assay (ELISA)
11. Western blotting
12. Immunization of protocols and raising antibody
13. Identification and enumeration of immune cells
14. Immunodiffusion assays
15. High titre sera preparation and its estimation
16. Agglutination test- Widal, Brucella, Weil-Felix test
17. Flocculation test-VDRL, Pregnancy test, Rose Waaler test and Paul Bunnel test
18. Amboceptor
19. HA and HAI tests
20. "C" reactive protein

Paper III - Biochemistry

Types of Macromolecules: Classification of macromolecules - polysaccharides, fats, proteins & nucleic acids structure and properties of:- Mono, di, oligo and polysaccharides, Complex carbohydrates - Aminoacids, peptides & proteins- Fatty acids, Glycerolipids, phospholipids, glycolopids and steroids- Pigments - chlorophyll

Nutritional types and carbohydrate metabolism

Concepts of metabolism–catabolism–anabolism–Bioenergetics–Free Energy–Entropy– Enthalpy–Thermodynamics laws – Nutrition and nutritional types - nutrients - organic - inorganic. autotrophs - heterotrophs - lithotrophs - organotrophs - phototrophs. Autotrophy - anoxygenic - oxygenic photosynthesis. Chemolithotrophy - sulphur - iron - hydrogen - nitrogen oxidation - methanogenesis - luminescences – respiratory metabolism -fermentation of carbohydrates - glycolysis - Kreb's cycle - mitochondrial transport pathways –pentose phosphate pathway, the Entner - Doudoroff pathway - homo and hetero lactic fermentations.

Nucleic acids: Structure & types of – DNA & RNA – their topology and functions. Chromosome organization in microbes. Artificial nucleic acid - PNA. Structure of tRNA, rRNA and mRNA.

Proteins: Primary, secondary and tertiary structure - structure determination -Ramachandran plot - Purification of proteins

Vitamins and hormones: Structure and properties of vitamins and hormones - Definition and nomenclature - biological availability

Solution– types of solution–standarisation– pH indicator–buffer and colloidal state– membrane phenomenon– osmosis–surface tension–adsorption viscosity.

Photometry–Definition, laws of photometry, absorbance, transmittance, absorption maxima instruments, parts of photometer, types of photometry-colorimetry, spectrophotometry, flame photometry, fluuorometry, choice of appropriate filter, measurements of solution, calculation of formula, applications.

Immunodiffusion Techniques, Radioimmunoassay & ELISA– Principles & Applications.
Electrophoresis – Principle, Types & Applications.
Polymerase Chain Reaction – Principle & Applications
Autoanalysers – Principle & Applications

Laboratory experimental animals, maintenance–handling–ethical issues in experimentation–biochemical, toxicological and histological studies.

Practical

Estimation of the following:

1. Preparation of buffers and normal solutions
2. Estimation of amino acids by Ninhydrin method and proteins by Biuret method and Lowry's method
3. Estimation of sugar, G.T.T., Urea, cholesterol, triglycerides, uric scid, A/G ratio, calcium, phosphorous, electrolytes.

Paper IV – Diagnostic Microbiology

Selection, collection and transport of specimens for microbiological examination - direct microscopic examination - cultivation, concentration, special techniques - rapid diagnostic tests.

1. Blood 2. Urine 3. Stools 4. Sputum 5. CSF 6. Throat swab 7. Tissue 8. Bacterial food poisoning and others

Important biochemical reactions and methods in bacteriology: IMViC, MPN, TSI, Sugar fermentation, urease, protease, oxidase, catalase, nitrate reduction etc

Antibiotic susceptibility tests

Bacterial culture techniques - aerobic and anaerobic - culture of bacteria from various specimens

Minimum inhibitory concentration (MIC) testing

Lab diagnosis of bacterial and fungal Infections.

History, Koach & River's postulates, Role of Microbiology in Medicine, Classification of medically important microbes, Normal Microbial flora, Infections– Source, Mode of transmission, Prevention of medically important microbes.

Microbial diseases, the properties of different types of pathogens, and the mechanisms of pathogenesis.

The role of the host in infectious disease, including natural barriers to infection, innate and acquired immune responses to infection, and inflammation.

Experimental approaches for identifying virulence genes and the advantages/disadvantages of each approach for specific pathogens.

Therapeutic options for microbial infections - preventive options.

The role of ecology and evolution in the spread of infectious diseases, comparing the role of transmission, population size and susceptibility, and virulence in endemic disease, epidemic disease, emerging and reemerging diseases, neglected tropical diseases.

Practical

1. Bacteriological examination of water and food samples
2. IMViC tests
3. Catalase/Oxidase test
4. TSI test
5. Urease, Protease and Lipase tests
6. Sugar fermentation tests
7. Nitrate reduction tests
8. Anaerobic culture of bacteria

THIRD YEAR

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 diarrhea 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

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 – 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 Diease (KFD).

Biology and morphology of mites.

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.

Practical

1. Preparation, Maintenance of Cell Cultures & Viral Inoculation
2. Lymphocyte Separation
3. ELISA in Viral diagnosis
4. IFA in viral diagnosis
5. Serodiagnosis of HIV
6. HAI
7. HA
8. IgM CAPTURE ELISA Chikungunya
9. IgM CAPTURE ELISA Dengue
10. Neutralization Test
11. Cell Toxicity Determination
12. Taxonomy of Ticks & Sandflies
13. Larval index
14. Native PAGE and isoenzyme analysis.
15. Insecticide (larval & adult) bioassays
16. Dusk & Dawn Collection

Paper III – Epidemiology, Biostatistics and Bio-Informatics

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

Approaches in epidemiology: Descriptive and analytical epidemiology, disease burden, natural history of diseases and measures of risk and death.

*Study design and sampling: I*ntroduction to study design in epidemiological investigations and sampling techniques.

Fundamentals of 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 inference: Concept and probability distribution. Normal distribution—density curves, applications and statistical tables. Concept of significance tests, parametric and nonparametric tests, standard error and confidence intervals.

Inferential statistics - Probability and distributions - Poisson, Binomial and Normal distribution - Chi-square test - Hypothesis test – Student's t-test - Correlation and Regression - ANOVA.

Practical

Analysis of biological macromolecules by spectroscopic methods

I.E PAPER – Bioinstrumentation and GLPs

Microscopy– Fluorescence, confocal and electron microscopic techniques—principles and applications. SEM, TEM, STEM, AFM and Confocal microscopy - staining methods for light microscope, SEM and TEM, microtome and ultramicrotome
General Biophysical methods-Measurement of pH, Radioactive labeling & counting, Autoradiography.
Soxlet apparatus
Flow cytometry
Fluorescence assorted cell sorting (FACS)
High throughput screening
Micro arrays
ISH & FISH
GM and Liquid scintillation counter
Surface plasma resonance spectroscopy
Spectroscopic methods - UV, VIS, IR, FT-IR, Mass spectroscopy
Chromatographic methods- HPTLC, HPLC, GC, GC-MS and various detectors
Lyophilization, spray drying
Homogenization methods, ultrasonication
Centrifugation and ultracentrifugation methods, density gradient centrifugation
2D Page, Next Generation sequencing

Fermentors (Pilot and Industrial) and controlling devices

Analytical techniques

Electrophoresis, chromatography, membrane filtration, NMR, X-ray Crystallography, EDAX. Autoanalyzer for hematology

Nucleic acid based diagnosis

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

Advanced Molecular Techniques

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

Introduction to Quality control

GLPs, GCPs, GMPs, QC, QA and Approvals; Various systems of accreditations and certifications in laboratory and healthcare practices

Total quality management framework.

Quality laboratory processes, Quality assurance, Quality assessment, Quality control,

Quality planning and Quality improvement.

Costs of conformance and non conformance, appraisal costs, prevention costs.

Internal quality control, basic steps, sources of error and their correction methods, CAPA - corrective action & preventive action.

Sources of variation in laboratory results.

Quality control charts, Levy- Jennings and Cusum charts.

External quality control.

Quality control programme, intrinsic and extrinsic and random errors.

Current trends in laboratory accreditation, *ISO certificate, West guard Rules.*