IIMS&R Medical Microbiology
PhD Entrance test syllabus

General Microbiology

- History of microbiology
- Microscopy
- Bio-safety including universal precautions
- Physical and biological containment
- Sterilization and disinfection
- Morphology of bacteria and other microorganisms
- Nomenclature and classification of microorganisms
- Normal flora of human body
- Growth & nutrition of bacteria and Bacterial metabolism
- Bacterial toxins and Bacteriocins
- Microbiology of hospital environment
- Microbiology of air, milk and water
- Host-parasite relationship
- Antibacterial substances and drug resistance
- Bacteriophages
- Quality assurance & quality control in microbiology
- Accreditation of laboratories

Immunology

- Components of the immune system
- Innate and acquired immunity
- Cells involved in immune response
- Antigens
- Immunoglobulins
- Antigen & antibody reactions
- Complement
- Hypersensitivity
- Immune responses - Humoral & Cell mediated immunity
- Cytokines
- Immunodeficiency disorders
- Autoimmunity
- Immune tolerance
- MHC complex
- Transplant and Cancer immunology
- Vaccines and immunotherapy
- Measurement of immunological parameters
- Immunological techniques
- Immunopotentiation & immunomodulation

Systematic bacteriology

- Isolation & identification of bacteria
- Gram positive cocci of medical importance including Staphylococcus, Streptococcus, Pneumococcus, Enterococcus and anaerobic cocci.
- Gram negative cocci of medical importance including Neisseria and Moraxella.
- Gram positive bacilli of medical importance including Corynebacterium, Bacillus, Actinomyces, Nocardia, Lactobacillus, Listeria, Clostridium and other spore bearing anaerobic bacilli etc.
- Gram negative bacilli of medical importance including Vibrios, Aeromonas, Plesiomonas, Haemophilus and HACEK group, Bordetella, Brucella, Gardnerella, Pseudomonas & other non-fermenters, Legionella, Pasteurella, Francisella,

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Bacteroides, Fusobacterium, Leptotrichia and other anaerobic gram negative bacilli, agents of rat bite fever, donovanosis and bacterial vaginosis etc.
- Helicobacter and Campylobacter
- Enterobacteriaceae
- Mycobacteria
- Spirochetes
- Chlamydiae
- Rickettsiae, Coxiella, Bartonella.
- Mycoplasma and *Ureaplasma*.

Virology

- General properties of viruses
- Nomenclature and Classification of viruses
- Morphology of Virus
- Virus replication
- Isolation & identification of viruses
- Pathogenesis of viral infections
- Genetics of viruses
- DNA viruses of medical importance including Poxviridae, Herpesviridae, Adenoviridae, Hepadnaviridae, Papovaviridae and Parvoviridae.
- RNA viruses of medical importance including Picornaviridae, Caliciviridae, Togaviridae, Flaviviridae, Coronaviridae, Rhabdoviridae, Filoviridae, Orthomyxoviridae, Paramyxoviridae, Reoviridae, Arenaviridae, Bunyaviridae and Retroviridae.
- Slow viruses and prions.
- Rodent borne viruses – Hantaviruses and Arenaviruses.
- Agents of viral gastroenteritis – including Rotavirus etc.
- Oncogenic viruses.
- Vaccines & anti-viral drugs

Parasitology

- General characters & classification of parasites
- Methods of identification of parasites
- Protozoan parasites of medical importance including Entamoeba, Free living amoebae, *Giardia Trichomonas, Leishmania, Trypanosoma, Plasmodium, Toxoplasma, Sarcocystis, Cryptosporidium, Microsporidium, Cyclospora. Isospora, Babesia, Balantidium* etc.
- Helminthology of medical importance including those belonging to Cestoda *(Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipyllidium, Multiceps etc.),* Trematoda *(Schistosomes, Fasciola. Fasciolopsis, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis etc.) and Nematoda (Trichiuris, Trichinella, Strongyloides, Ancylostoma, Necator, Ascaris, Toxocara, Enterobius Filarial worms, Dracunculus* etc.)
- Entomology: common arthropods & other vectors viz. mosquito, sandfly, ticks, mite, cyclops, louse, myasis.
- Antiparasitic agents.

Mycology

- General characteristics & classification of fungi
- Morphology & reproduction of fungi
- Isolation & identification of fungi
- Tissue reactions to fungi
- Yeasts and yeast like fungi of medical importance including Candida. *Cryptococcus, Malassezia, Trichosporon, Geotrichum, Saccharomyces etc.*

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- Mycelial fungi of medical importance including Aspergillus, Zygomycetes, *Pseudoallescheria,Fusarium, Piedra, other dematiaceous hyphomycetes and other hyalohyphomycetes* etc.
- Dimorphic fungi including *Histoplasma, Blastomyces, Coccidioides, Paracoccidioides, Sporothrix, ,Penicillium marneffei* etc.
- Dermatophytes
- Fungi causing mycetoma, keratomycosis & otomycosis.
- Pythium insidiosum
- Prototheca
- Pneumocystis carinii infection
- Rhinosporidium seeberi & Loboa loboi
- Common laboratory contaminant fungi
- Mycetismus & mycotoxicosis
- Antifungal agents & invitro antifungal susceptibility tests.

Genetics & Molecular Biology

- Principles of bacterial genetics.
- Plasmids.
- Bacterial variation – Phenotypic and Genotypic. Mutation, its classification and detection. Ames test (Carcinogenicity testing).
- Horizontal gene transfer in bacteria – Transformation, Transduction, Lysogenic conversion and Conjugation.
- Bacterial recombination.
- Transposition.
- Genetic Engineering – recombinant DNA technology.
- Nucleic Acid probe.
- Blotting techniques.
- Molecular methods relevant for medical microbiology – Amplification based methods such as Polymerase chain reaction (PCR), Real-time polymerase chain reaction (rt-PCR), Ligase chain reaction (LCR), Transcription mediated amplification (TMA), Nucleic acid sequence based amplification (NASBA), Strand displacement amplification (SDA), Loop mediated isothermal amplification (LAMP), Automated PCR such as Biofire FilmArray and Cartridge based nucleic acid amplification test (CB-NAAT).
- Molecular methods based on non-amplification methods such as Line probe assay.
- Gel electrophoresis.
- Nucleic acid sequencing and Pyrosequencing.
- Restriction enzymes and vectors.
- Restriction fragment length polymorphism (RFLP), Amplified gragment length polymorphism (AFLP), Single nucleotide polymorphism (SNP) and Random amplification of polymorphic DNA (RAPD).
- Variable number tandem repeat (VNTR) analysis and Multiple loci VNTR analysis (MLVA).
- Gene cloning and Gene therapy.

Applied Microbiology

- Epidemiology of infectious diseases.
- Hospital acquired infections (HAI) & its control measures.
- Management of hospital waste
- Investigation of an infectious outbreak
- Infections of various organs and systems of human body and their lab diagnosis viz. respiratory tract infections, urinary tract infections, central nervous system infections, congenital infections, reproductive tract infections, gastrointestinal infections, hepatitis, pyrexia of unknown origin, infections of eye, ear& nose, skin & wound infections septicaemia, endocarditis, haemorrhagic fever etc.

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- Opportunistic infections.
- Sexually transmitted diseases
- Vaccinology: principle, methods of preparation, administration of vaccines
- Information technology (Computers) in microbiology
- Epidemiological typing techniques
- Automation in Microbiology
- Statistical analysis of microbiological data and research methodology
- Animal & human ethics involved in microbiological work

Diagnostic Microbiology

- Collection/transport of specimens for microbiological investigations
- Preparation, examination & interpretation of direct smears from clinical specimens
- Plating of clinical specimens on media for isolation, purification, identification and quantitation purposes.
- Preparation of stains viz. Gram, Albert's, capsules, spores, Ziehl Neelsen (ZN) Silver impregnation stain etc.
- Preparation of media like Nutrient agar, Blood Agar, Mac-conkey agar, Sugars, Serum sugars, Kligler iron agar, Robertson's cooked meat broth, Lowenstein Jensens medium, Sabouraud's dextrose agar etc.
- Preparation of reagents -oxidase, Kovac etc. Quality control of media, reagents etc.
- Operation of autoclave, hot air oven, distillation plant, filters like Sietz and membrane filters
- Care and operation of microscopes
- Washing and sterilisation of glassware (plugging and packing)
- Care and maintenance of common laboratory equipments like water bath, centrifuge, refrigerators, incubators etc.
- Sterility tests
- Identification of bacteria of medical importance upto species level (except anaerobes which could be upto generic level).
- Techniques of anaerobiosis.

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