



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

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COMPETENCY BASED MEDICAL EDUCATION

(CBME)

(with effect from 2020-2021 Batches)

**Curriculum for
Doctor of Medicine
Microbiology**

Approved as per AC-41/2021, Dated 27/08/2021

Amended History

1. Approved as per AC - 41/2021, Resolution No.4.21; Dated 27/08/2021.

Item 9: To restructure the Curriculum for MD Microbiology as per Postgraduate training guidelines from batch appearing in university exams in 2023 onwards

MD Microbiology

Curriculum and Syllabus (CBME)

COURSE OVERVIEW:

Duration of the Course

The period of certified study and training for the Post-Graduate MD MICROBIOLOGY shall be Three Academic years.

Attendance

All students joining the postgraduate training program shall work as full time residents during the period of training, attending not less than 80% (eighty percent) of the training during each calendar year, and will be given full time responsibility, assignments and participation in all facets of the educational process.

The period of training for obtaining the degrees shall be three completed years including the period of examination.

COURSE CONTENTS (SYLLABUS)

Paper I: General Microbiology

1. History of microbiology
2. Microscopy
3. Bio-safety including universal containment, personal protective equipment for biological agents
4. Physical and biological containment
5. Isolation precautions including standard precautions and transmission based precautions
6. Sterilization, disinfection and lyophilization
7. Morphology of bacteria and other microorganisms
8. Nomenclature and classification of microorganisms
9. Normal flora of human body

10. Growth and nutrition of bacteria
11. Bacterial metabolism
12. Bacterial toxins
13. Bacteriocins
14. Microbiology of hospital environment
15. Microbiology of air, milk and water
16. Host-parasite relationship
17. Antimicrobial agents and mechanisms drug resistance
18. Bacterial genetics and bacteriophages
19. Molecular genetics relevant for medical microbiology
20. Quality assurance and quality control in microbiology
21. Accreditation of laboratories

Immunology

1. Components of immune system
2. Innate and acquired immunity
3. Cells involved in immune response
4. Antigens
5. Immunoglobulins
6. Mucosal immunity
7. Complement
8. Antigen and antibody reactions
9. Hypersensitivity
10. Cell mediated immunity
11. Cytokines
12. Immunodeficiency
13. Auto-immunity
14. Immune tolerance
15. MHC complex
16. Transplantation immunity
17. Tumor immunity
18. Vaccines and immunotherapy

19. Measurement of immunological parameters
20. Immunological techniques
21. Immunopotential and immunomodulation

Paper II: Systematic bacteriology

1. Isolation and identification of bacteria
2. Gram positive cocci of medical importance including Staphylococcus, Micrococcus, Streptococcus, anaerobic cocci etc.
3. Gram negative cocci of medical importance including Neisseria, Branhamella, Moraxella etc.
4. Gram positive bacilli of medical importance including Lactobacillus, Coryneform organisms, Bacillus and aerobic bacilli, Actinomyces, Nocardia, Actinobacillus and other actinomycetales, Erysipelothrix, Listeria, Clostridium and other spore bearing anaerobic bacilli etc.
5. Gram negative bacilli of medical importance including Vibrios, Aeromonas, Plesiomonas, Haemophilus, Bordetella, Brucella, Gardnerella, Pseudomonas and other non-fermenters, Pasteurella, Francisella, Bacteroides, Fusobacterium, Leptotrichia and other anaerobic gram negative bacilli etc.
6. Helicobacter, Campylobacter, Calymmatobacterium, Streptobacillus, Spirillum and miscellaneous bacteria
7. Enterobacteriaceae
8. Mycobacteria
9. Spirochaetes
10. Chlamydia
11. Mycoplasmatales, Mycoplasma, Ureaplasma, Acholeplasma and other Mycoplasmas.
12. Rickettsiae, Coxiella, Bartonella etc.

Mycology

1. General characteristics and classification of fungi
2. Morphology and reproduction of fungi
3. Isolation and identification of fungi
4. Tissue reactions to fungi

5. Yeasts and yeast like fungi of medical importance including Candida, Cryptococcus, Malassezia, Trichosporon, Geotrichum, Saccharomyces etc.
6. Mycelial fungi of medical importance including Aspergillus, Zygomycetes, Pseudallescheria, Fusarium, Piedra, other dematiaceous hyphomycetes and other Hyalohyphomycetes etc.
7. Dimorphic fungi including Histoplasma, Blastomyces, Coccidioides, Paracoccidioides, Sporothrix, Penicillium marneffei etc.
8. Dermatophytes
9. Fungi causing Mycetoma, Chromoblastomycosis, Occulomycosis and Otomycosis.
10. Pythium insidiosum
11. Prototheca
12. Pneumocystis jirovecii infection
13. Rhinosporidium seeberi and Lacazia loboi (Loboaloboi)
14. Laboratory contaminant fungi
15. Mycetism and mycotoxicosis
16. Antifungal agents and in vitro antifungal susceptibility tests.

Paper III: Virology

1. General properties of viruses
2. Classification of viruses
3. Morphology: Virus structure
4. Virus replication
5. Isolation and identification of viruses
6. Pathogenesis of viral infections
7. Genetics of viruses
8. DNA viruses of medical importance including Pox viruses, Herpes viruses, Adenoviruses, Hepadna virus, Papova and Parvo viruses etc.
9. RNA viruses of medical importance including Enteroviruses, Toga viruses, Flavi viruses, Orthomyxo viruses, Paramyxo viruses, Reo viruses, Rhabdoviruses, Arena viruses, Bunya viruses, Retro viruses, Filo viruses, Human immune deficiency virus, Arbo viruses, Corona viruses and Covid Pandemic, Calci viruses etc.
10. Slow viruses including prions
11. Unclassified viruses
12. Hepatitis viruses

13. Virioids, prions

14. Vaccines and anti-viral drugs.

Parasitology

1. General characters and classification of parasites.
2. Methods of identification of parasites
3. Protozoan parasites of medical importance including Entamoeba, Free living amoebae, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium, Toxoplasma, Sarcocystis, Cryptosporidium, Microsporidium, Cyclospora, Babesia, Balantidium, etc.
4. Helminthology of medical importance including those belonging to Cestoda (Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipylidium, Multiceps etc.), Trematoda (Schistosomes, Fasciola, Fasciolopsis, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis etc.) and Nematoda (etc.)
5. Entomology: common arthropods and other vectors viz. mosquito, sand fly, ticks, mite, cyclops, louse, myiasis.
6. Anti-parasitic agents.

Paper IV: Applied Microbiology

1. Epidemiology of infectious diseases
2. Antimicrobial prophylaxis and therapy
3. Hospital acquired infections
4. Management of biomedical waste
5. Investigation of an infectious outbreak in hospital and community
6. Infections of various organs and systems of human body 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 and nose, septicaemia, endocarditis, haemorrhagic fever etc.
7. Opportunistic infections
8. Sexually transmitted diseases
9. Vaccinology: principles, methods of preparation, administration of vaccines, types of vaccines
10. Information technology (Computers) in microbiology

11. Automation in Microbiology
12. Molecular techniques in the laboratory diagnosis of infectious diseases
13. Statistical analysis of microbiological data and research methodology
14. Animal and human ethics involved in microbiological work.
15. Safety in laboratory and Laboratory management

PRACTICALS (SKILLS)

1 st year residency-skills list					
Area	Sr. no.	Procedure	Observed no.	Assisted no./ practice on dummy	Performed independently no.(under supervision)
General microbiology	1.	Microscopy for unstained preparations/ wet mount	5	5	10
	2.	Microscopy for stained preparation	5	5	10
	3.	Preparation of direct smears from clinical specimens	5	5	10
	4.	Hanging drop preparation	5	5	10
	5.	Washing, sterilization and packing of glassware	10 sessions	-	-
	6.	Infection control activities-environmental sampling	10	10	-
	7.	Identification of HAI	5	5	--
	8.	Calculation of HAI quality indicators	5	5	--
	9.	Bacteriology of water	5	5	-
	10.	Bacteriology of air	5	5	-
	11.	Antibiotic disc preparation	-	-	-
	12.	Handling of laboratory animal	-	-	-
	13.	Methods for preservation of bacteria	10	-	-
	14.	Maintenance of stock cultures	10	-	-
Staining	1	Gram staining	10	20	30
	2	Acid fast staining (Ziehl-Neelsen method)	10	20	30
	3	Albert staining	5	10	10
	4	Modified ZN staining for <i>M. leprae</i>	5	5	5

	5	Modified ZN staining for <i>Nocardia</i>	5	5	5
	6	IQC-staining	5	5	5
Media preparation	1	Preparation of stains	4	4	4
	2	Preparation of reagents	10	10	10
	3	Preparation, plugging, pouring & Quality Control (QC) of culture media	20	20	30

	4	Operation & maintenance of autoclave	10	10	20
Bacteriology	1	Specimen collection for Blood Culture	5	5	5
	2	Inoculation of liquid & solid media	20	20	30
	3	Identification test	20	20	30
	4	Antimicrobial sensitivity testing- modified Kirby-bauer technique	10	20	30
	5	IQC- Antibiotic disc potency	5	5	-
	6	Operation of BacT/ALERT	5	10	20
	7	Operation of Vitek 2 compact	5	10	20
	8	Petroff's concentration technique	10	10	20
	9	AFB culture & sensitivity	5	10	20
Mycology	1	KOH Wet mount	5	10	20
	2	Germ tube test	5	10	20
	3	Slide culture	5	10	20
	4	Negative staining for fungus	5	5	5
	5	LPCB mount	10	10	10
Parasitology	1	Giemsa staining for thick & thin peripheral blood smear	5	-	-
	2	Stool wet mount for R/M	10	20	30
	3	Stool concentration techniques	5	10	5
	4	Modified ZN staining for <i>C. parvum</i>	2	2	2
Serology/ Immunology	1	Phlebotomy & separation of serum	10	10	5
	2	Operation & maintenance of mini-VIDAS	5	10	20
	3	Operation & maintenance of ELISA reader & washer	5	10	--
		Performance of serological tests			
	1	Latex agglutination test(RA, ASO)	10	20	30
	2	RPR card test	10	20	30
	3	Tube agglutination test	10	20	30
	4	Gold conjugate Rapid card test	10	20	30
	5	ANA by IF	5	5	--
	6	ANA by Immunoblot	5	5	--
	7	IQC-serology	5	5	5

2 nd year residency-skill list					
Area	Sr. no.	Procedure	Observed no.	Assisted no./ Practice on dummy	Performed independently no. (under supervision)
General microbiology	1.	Microscopy for unstained preparations/ wet mount	---	--	--
	2.	Microscopy for stained preparation	--	--	--
	3.	Preparation of direct smears from clinical specimens	--	--	--
	4.	Preparation of slit skin smear for lepra bacilli	5	5	5
	5.	Hanging drop preparation	--	--	10
	6.	Washing, sterilization and packing of glassware	05 sessions	-	-
	7.	Infection control activities- environmental sampling	--	10	10
	8.	Identification of HAI	--	5	5
	9.	Calculation of HAI quality indicators	--	5	5
	10.	Bacteriology of water	--	5	5
	11.	Bacteriology of air	--	5	5
	12.	Antibiotic disc preparation	05 lots	-	-
	13.	Handling of laboratory animal	-	-	-
	14.	Methods for preservation of bacteria	--	05	10
	15.	Maintenance of stock cultures	--	05	10
Staining	1	Gram staining	--	--	30
	2	Acid fast staining (Ziehl-Neelsen method)	--	--	30
	3	Albert staining	--	--	05
	4	Modified ZN staining for <i>M. leprae</i>	--	--	5
	5	Modified ZN staining for <i>Nocardia</i>	--	--	5
	6	IQC-staining	--	--	5
Media preparation	1	Preparation of stains	--	--	5
	2	Preparation of reagents	--	--	15
	3	Preparation, plugging, pouring & Quality Control (QC) of culture media	--	--	50
	4	Operation & maintenance of autoclave	--	--	20
Bacteriology	1	Specimen collection for Blood Culture	--	--	5
	2	Inoculation of liquid & solid media	--	--	30
	3	Identification test	--	--	30
	4	Antimicrobial sensitivity testing- modified Kirby-bauer technique	--	--	30
	5	IQC- Antibiotic disc potency	--	5	5
	6	Operation of BacT/ALERT	--	--	20
	7	Operation of Vitek 2 compact	--	--	20
	8	Petroff's concentration technique	--	--	20
	9	AFB culture & sensitivity	--	--	20

Mycology	1	KOH Wet mount	--	--	20
	2	Germ tube test	--	--	20
	3	Slide culture	--	--	20
	4	Negative staining for fungus	--	--	5
	5	LPCB mount	--	--	10
Parasitology	1	Giemsa staining for thick & thin peripheral blood smear	-	10	-
	2	Stool wet mount for R/M	--	--	30
	3	Stool concentration techniques	--	--	5
	4	Modified ZN staining for <i>C. parvum</i>	--	--	2
Serology/ Immunology	1	Phlebotomy & separation of serum	--	--	5
	2	Operation & maintenance of mini-VIDAS	--	--	20
	3	Operation & maintenance of ELISA reader & washer	--	--	20
		Performance of serological tests			
	1	Latex agglutination test(RA, ASO, CRP)	--	--	30
	2	RPR card test	--	--	30
	3	Tube agglutination test	--	--	30
	4	Gold conjugate rapid card test	--	--	30
	5	ANA by IF	--	--	10
	6	ANA by Immunoblot	--	--	10
7	IQC-serology	--	--	5	

3rd year residency-skill list

Area	Sr. no.	Procedure	Observed no.	Assisted no./ practice on dummy	Performed independently no. (under supervision)
General microbiology	1.	Microscopy for unstained preparations/ wet mount	---	--	--
	2.	Microscopy for stained preparation	--	--	--
	3.	Preparation of slit skin smear for lepra bacilli	--	--	--
	4.	Hanging drop preparation	--	--	--
	5.	Washing, sterilization and packing of glassware	05 sessions	-	-
	6.	Infection control activities-environmental sampling	--	--	10
	7	Identification of HAI	--	--	5
	8	Calculation of HAI quality indicators	--	--	5
	9	Bacteriology of water	-	-	5
	10	Bacteriology of air	-	-	5
	11	Antibiotic disc preparation	-	5 lots	2 lots
	12	Handling of laboratory animal	-	-	10
	13	Methods for preservation of bacteria	-	-	10
	14	Maintenance of stock cultures	-	-	10
Staining	1	Gram staining	--	--	30
	2	Acid fast staining (Ziehl-Neelsen method)	--	--	30
	3	Albert staining	--	--	05
	4	Modified ZN staining for <i>M. leprae</i>	--	--	5
	5	Modified ZN staining for <i>Nocardia</i>	--	--	5
	6	IQC-staining	--	--	5
Media preparation	1	Preparation of stains	--	--	10
	2	Preparation of reagents	--	--	15
	3	Preparation, pouring & Quality Control (QC) of culture media	--	--	50
	4	Operation & maintenance of autoclave	--	--	20

Bacteriology	1	Specimen collection for Blood Culture	--	--	5
	2	Inoculation of liquid & solid media	--	--	30
	3	Identification test	--	--	30
	4	Antimicrobial sensitivity testing- modified Kirby-bauer technique	--	--	30
	5	IQC- Antibiotic disc potency	--	--	5
	6	Operation of BacT/ALERT	--	--	20
	7	Operation of Vitek 2 compact	--	--	20
	8	Petroff's concentration technique	--	--	20
	9	AFB culture & sensitivity	--	--	20
Mycology	1	KOH Wet mount	--	--	20
	2	Germ tube test	--	--	20
	3	Slide culture	---	---	20
	4	Negative staining for fungus	--	--	5
	5	LPCB mount	--	--	10
Parasitology	1	Giemsa staining for thick & thin peripheral blood smear	--	--	-
	2	Stool wet mount for R/M	--	--	30
	3	Stool concentration techniques	--	--	5
	4	Modified ZN staining for <i>C. parvum</i>	--	--	2
Serology/ Immunology	1	Phlebotomy & separation of serum	--	--	5
	2	Operation & maintenance of mini-VIDAS	--	--	20
	3	Operation & maintenance of ELISA reader & washer	--	--	20
		Performance of serological tests			
	1	Latex agglutination test(RA, ASO, CRP)	--	--	30
	2	RPR card test	--	--	30
	3	Tube agglutination test	--	--	30
	4	Gold conjugate rapid card test	--	--	30
	5	ANA by IF	--	--	10
	6	ANA by Immunoblot	--	--	10
	7	IQC-serology	--	--	5

PG TEACHING TOPIC IN MICROBIOLOGY

Sr. Nos	Topic	Section
1	Historical aspects of Microbiology	General Microbiology
2	Structure of bacteria	General Microbiology
3	Bacterial growth, nutrition metabolism	General Microbiology
4	Microscopes	General Microbiology
5	Disinfection	General Microbiology
6	Culture methods	General Microbiology
7	Bacterial genetics and mutation	General Microbiology
8	Bacterial gene transfer	General Microbiology
9	Infection	General Microbiology
10	Immunity	Immunology
11	Immunoglobulins	Immunology
12	Precipitation	Immunology
13	Agglutination	Immunology
14	ELISA	Immunology
15	Complement	Immunology
16	Anaphylaxis	Immunology
17	Autoimmunity	Immunology
18	Tumour immunity	Immunology
19	Transplantation immunity	Immunology
20	MRSA	Systemic Bacteriology
21	Streptococcal infections	Systemic Bacteriology
22	Gas gangrene	Systemic Bacteriology
23	Salmonellosis	Systemic Bacteriology
24	Leptospirosis	Systemic Bacteriology
25	Rickettial diseases	Systemic Bacteriology
26	PUO	Systemic Bacteriology
27	Diarrheal diseases	Systemic Bacteriology
28	STDs	Systemic Bacteriology
29	UTI	Systemic Bacteriology

30	Superficial Mycosis	Mycology
31	Deep mycosis	Mycology
32	Opportunistic mycosis	Mycology
33	Hepatitis B	Virology
34	Enteroviruses	Virology
35	Retroviruses	Virology
36	Oncogenic viruses	Virology
37	Arboviruses	Virology
38	Malaria	Parasitology
39	Toxoplasmosis	Parasitology
40	Lymphatic filariasis	Parasitology
41	Tapeworm and Cysticercosis	Parasitology
42	Leishmaniasis	Parasitology
43	Free living amoebae	Parasitology
44	Healthy gene	Bioethics
45	Universal principles	Bioethics
46	Outbreak report	Bioethics
47	Drug resistance minimization	Bioethics
48	Sterilization Techniques	Bioethics
49	Biosafety and Biohazard	Bioethics
50	Environmental ethics	Bioethics
51	CBNAAT	Molecular
52	Line Probe Assay	Molecular
53	Polymerase Chain Reaction (PCR)	Molecular
54	Automated Blood culture system	Miscellaneous
55	Vaccines	Miscellaneous
56	Bacteriology of Water	Miscellaneous
57	Bacteriology of Air	Miscellaneous
58	Bacteriology of Food	Miscellaneous
59	Normal microbial flora	Miscellaneous
60	Emerging and Reemerging Infections	Miscellaneous
61	Role of RT PCR in diagnosis of SARS COV 2	Covid Pandemic
62.	RAT and other tests for diagnosis of SARS	Covid Pandemic

	COV 2	
63.	Covid Vaccines	Covid Pandemic
64.	Post Covid Microbial complications	Covid Pandemic
65.	Setting up a biosafety level 4 lab for Covid and other viral infections	Covid Pandemic

Emergency duty

The student should be posted for managing emergency laboratory services in Microbiology. He/she should deal with all emergency investigations in Microbiology.

MAINTENANCE OF LOG BOOK

Each post graduate student shall maintain a record of skills acquired during the three years of training period, in various sections. The log book to be submitted at the time of practical examination.

It is must that a post graduate student during the course to present one poster presentation and to read one paper at a national /state conference and to present one research paper which can be published/accepted for publication

TEACHING/LEARNING METHODS:

Learning in M.D. (Microbiology) will essentially be self learning. Following teaching/learning methods shall be followed

Group teaching sessions:

1. Journal clubs
2. Subject seminar presentation
3. Group discussion
4. Slide seminars
5. Presentations of the finding of an exercise on any of the sub-specialties
6. Preparation in CME programs and conferences
7. Didactic PG lectures

Hands on experience (practical training)

Practical shall be imparted by posting the students in various sub- specialities (sections) as detailed in the intrinsic and extrinsic rotations. Students shall be actively involved in day to day working of all the sections. He/she will be trained under direct supervision of the teachers in all the aspects of Clinical Microbiology and applied aspects of laboratory medicine including handling and processing of the specimens

Assessments and Evaluation:

A. INTERNAL EXAMINATION

Portion:

1 st Internal Exam	2 nd Internal Exam	Prelims
<p>GENERAL</p> <p>MICROBIOLOGY:</p> <ol style="list-style-type: none"> 1. History and Pioneers in Microbiology 2. Microscopy 3. Nomenclature and classification of microbes 4. Morphology of bacteria and other micro-organisms 5. Growth and Nutrition of bacteria 6. Bacterial metabolism 7. Sterilization and disinfection 8. Culture media and culture methods 9. Identification of bacteria 10. Bacterial toxins 11. Bacterial antagonism : Bacteriocins 12. Bacterial genetics 13. Gene cloning 14. Antibacterial substances used in the treatment of infections and drug resistance in bacteria 15. Bacterial ecology - Normal flora of human body, Hospital environment, Air, Water and Milk 16. Host-parasite relationship 	<p>IMMUNOLOGY :Clinical</p> <ol style="list-style-type: none"> 1. Hypersensitivity 2. Immunodeficiency 3. Auto-immunity 4. Immune tolerance 5. Transplantation immunity 6. Tumour immunity 7. Immunoprophylaxis and immunotherapy 8. Measurement of immunity 	<p>GENERAL</p> <p>MICROBIOLOGY & IMMUNOLOGY:</p> <p>All</p>

<p>IMMUNOLOGY :</p> <ol style="list-style-type: none"> 1. Innate and acquired immunity 2. Antigens 3. Immunoglobulins 4. Antigen and antibody Reactions 5. Complement System 6. The normal immune system: structure and function 7. Immune Response 	<p>SYSTEMATIC BACTERIOLOGY</p> <ol style="list-style-type: none"> 1. <i>Streptococcus and Lactobacillus</i> 2. <i>Staphylococcus and Micrococcus</i> 3. <i>Pseudomonas</i> 4. <i>The Enterobacteriaceae</i> 5. <i>Mycobacteria</i> 6. <i>Corynebacterium</i> and other <i>Coryneform</i> bacteria 7. <i>Vibrios, Aeromonas, Plesiomonas, Campylobacter & Spirillum</i> 8. <i>Neisseria, Branhamella & Moraxella</i> 9. <i>Haemophilus and Bordetella</i> <i>Bacillus</i>: the aerobic spore-bearing bacilli 11. <i>Clostridium</i>: the spore-bearing anaerobic bacilli 12. Non-spore bearing anaerobe 10. <i>The Spirochaetes</i> 	<p>SYSTEMATIC BACTERIOLOGY (2nd year) : plus</p> <ol style="list-style-type: none"> 1. <i>Actinomycetes, Nocardia and Actinobacillus</i> 2. <i>Erysipelothrix and Listeria</i> 3. <i>The Bacteroidaceae: Bacteroides, Fusobacterium and Leptotrichia</i> 4. <i>Chromobacterium, flavobacterium, Acinetobacter and Alkaligenes</i> 5. <i>Pasteurella, Francisella</i> 6. <i>Brucella</i> 7. <i>Chlamydia</i> 8. <i>Rickettsiae</i> 9. <i>Mycoplasmatales: Mycoplasma, Ureaplasma and Acholeplasma</i> <p>Miscellaneous bacteria</p>
<p>MICROBIOLOGY APPLIED TO TROPICAL MEDICINE AND RECENT ADVANCES</p> <ol style="list-style-type: none"> 1. Normal Microbial flora 2. Epidemiology of infectious diseases 3. Hospital acquired infections & Hospital waste disposal 4. Bacteriology of water, milk and air 	<p>VIROLOGY:</p> <ol style="list-style-type: none"> 1. The nature of viruses 2. Classification of viruses 3. Morphology: virus structure 4. Virus replication 5. The genetics of viruses 6. The pathogenicity & lab diagnosis of viruses 7. Epidemiology of viral infections 8. Anti-viral drugs 9. Bacteriophages 10. <i>Herpesviruses</i> 11. <i>Paramyxoviruses</i> 12. <i>Influenza virus</i> 13. <i>Hepatitis viruses</i> 14. <i>Rabies virus</i> 15. <i>Human immune deficiency viruses</i> 16. <i>SARS COV 2</i> 	<p>VIROLOGY (2nd year): plus</p> <ol style="list-style-type: none"> 1. Vaccines 2. <i>Pox viruses</i> 3. <i>Vesicular viruses</i> 4. <i>Togaviruses</i> 5. <i>Bunyaviruses</i> 6. <i>Arenaviruses</i> 7. <i>Marburg and Ebola viruses</i> 8. <i>Rubella virus</i> 9. <i>Orbiviruses</i> 10. Respiratory diseases : <i>Rhinoviruses, adenoviruses and corona viruses</i> 11. <i>Enteroviruses; Polio, Echo and Coxsackieviruses</i> 12. Other enteric viruses 13. Slow viruses 14. Oncogenic viruses 15. Teratogenic viruses

	<p>PARASITOLOGY:</p> <ol style="list-style-type: none"> 1. General Parasitology 2. Protozoan parasites of medical importance: <i>Entamoeba, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium</i> 	<p>PARASITOLOGY (2nd year): plus</p> <ol style="list-style-type: none"> 1. Protozoan parasites of medical importance: <i>Toxoplasma, Sarcocystis, Cryptosporidium, Babesia, Balantidium etc.</i> 2. Helminthology: All those medically important helminthes belonging to Cestoda, Trematoda and Nematoda. 3. Cestodes: <i>Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipylidium, Multiceps etc.</i> 4. Trematodes: <i>Schistosomes, Fasciola, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis etc.</i> 5. Nematodes: <i>Trichuris, Trichinella, Strongyloides, Ancylostoma, Necator, Ascaris, Toxocara, Enterobius, Filarial worms, Dracunculus, etc.</i> 6. Ecto-parasites: Common arthropods and other vectors viz., Mosquito, Sand fly, Ticks, Mite, Cyclops
	<p>MYCOLOGY</p> <ol style="list-style-type: none"> 1. The morphology and reproduction of fungi 2. Classification of fungi 3. <i>Dermatophytes</i> 4. <i>Candida</i> 5. <i>Aspergillus</i> 	<p>MYCOLOGY (2nd year): plus</p> <ol style="list-style-type: none"> 1. Contaminant and opportunistic fungi 2. Fungi causing superficial mycoses 3. Fungi causing subcutaneous mycoses 4. Fungi causing systemic infections 5. Anti-mycotic agents

**MICROBIOLOGY
APPLIED TO
TROPICAL MEDICINE
AND RECENT**

ADVANCES

1. Infections of various organs and systems of human body
2. Molecular genetics as applicable to microbiology
3. Vaccinology: principle, methods of preparation, administration of vaccines.
4. Bio-terrorism

COVID PANDEMIC

1. Role of RT PCR in diagnosis of SARS COV 2
2. RAT and Other tests in diagnosis of SARS COV 2
3. Covid Vaccines
4. Microbial complications on post covid patients

**ALLIED BASIC
SCIENCES**

(a) Biochemistry: Basic understanding of biochemistry as applied to immunological/ molecular methods for study of microbial diseases and pathogenesis of infections.

1. Protein purification and estimation
2. Protein estimation
3. Nucleic acid purification and characterization
4. Agarose and polyacrylamide gelelectrophoresis - principles
5. Ultracentrifugation –

		<p>principles</p> <p>6. Column chromatography – principles</p> <p>(b) Molecular biology: Basic knowledge as applicable to molecular diagnostics and molecular epidemiology.</p> <ol style="list-style-type: none"> 1. Recombinant DNA technology 2. Southern, northern and western blotting 3. DNA amplification techniques 4. Diagnostic PCR, different methods of PCR product detection (liquid hybridization, ELISA). 5. Genotyping of microbes and viruses <p>(c) Pathology: (as applied to Microbiology) Basic knowledge of</p> <ol style="list-style-type: none"> 1. Inflammation and repair 2. Intercellular substances and reaction 3. Pathological changes in the body in bacterial, viral, mycotic and parasitic infections <p>Demonstration of pathogen in tissue section</p>
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Internal Exam Pattern:

Internal exam will be held every year in the month of March/ April for all PG students

1st year exam	
Theory (one paper) of 100 marks	BAQs :10/11 questions (10Marks each) Total : 100 marks
Practical 100 marks	Gram stain: 15 marks ZN stain : 15 marks Serology : 20 marks Grand viva : 50 marks Total : 100 marks
2nd year exam	
Theory (two papers) 100 marks each	I Immunology and Systemic Bacteriology II Virology, Parasitology and Mycology BAQs :10/11 questions (10Marks each) Total : 200 marks
Practical	Bacteriology long exercise : 40 marks Bacteriology short exercise : 20 marks Mycobacteriology: 10 Marks Serology : 20 marks Fungal culture : 20 marks Virology exercise : 20 Marks Stool examination: 20 Marks

	<p>Grand viva : 50 marks</p> <p>Total : 200 Marks</p>
Prelim exam (3rd year exam)	
<p>Theory (four papers) 100 marks each (Same as University Exam)</p>	<p>I General Microbiology, Immunology and Basic Sciences</p> <p>II Systemic Bacteriology</p> <p>III Mycology , virology and Parasitology</p> <p>IV Applied Microbiology& Recent advances</p> <p>Total : 400 marks</p>
<p>Practical (Same as University exam)</p>	<p>Bacteriology Long Case- 60 Marks</p> <p>Bacteriology Short Case- 40 Marks</p> <p>Virology exercise- 40 Marks</p> <p>Parasitology Exercise -40 Marks</p> <p>Mycology Exercise- 40 Marks</p> <p>Serology Exercise- 40 marks</p> <p>Pedagogy -10 Marks</p> <p>Identification of Slides- 30 Marks</p> <p>Grand viva- 100 Marks</p> <p>Total : 400 marks</p>

B. UNIVERSITY EXAMINATION

Final university examination shall be at the end of three years. Obtaining a minimum of 50% marks in theory as well as practical separately shall be mandatory for passing examination as a whole.

1. **THEORY:** there shall be four theory papers of 100 marks each. Each paper shall be of 3 hours duration.

Paper 1 General Microbiology, Immunology and Basic Sciences

Paper 2 Systemic bacteriology

Paper 3 Mycology, Virology and Parasitology

Paper 4 Applied Microbiology and Recent advances

2. PRACTICAL SCHEME

Sr No	EXERCISE/VIVA	MAXIMUM MARKS
A)	Long Exercise Bacteriology	60
B)	Short Exercises	
	Short Exercise Bacteriology	40
	Virology /Molecular Exercise	40
	Mycology Exercise	40
	Parasitology Exercise	40
	Serology Exercise	40
	Identification Of Slides	30
	Microteaching/ Pedagogy	10
C)	Oral (Viva Voce)	100
	Total Of A, B, C	400

Day 1	Day 2
Long exercise Bacteriology	Bacteriology Long exercise (Contd)
Bacteriology Short Exercise	Bacteriological Short Exercise (Contd)
Exercise in Parasitology	Mycology culture (Contd)
Exercise in Virology	Pedagogy
Mycology culture	Identification of Slides
Exercise in Serology	Grand Viva
<ul style="list-style-type: none"> • The above schedule can change as per the decision of the examiners 	

THESIS

Every candidate shall carry out work on an assigned research project under the guidance of a recognized Postgraduate Teacher, the result of which shall be written and submitted in the form of a Thesis. Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.

Thesis shall be submitted at least six months before the theoretical and clinical / practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and practical examination. A post graduate student shall be allowed to appear for the final examination only after the acceptance of the thesis by the examiners.

Thesis should consist of

- (a) Introduction
- (b) Review of literature
- (c) Aims and objectives
- (d) Material and methods
- (e) Result
- (f) Discussion
- (g) Summary and conclusion
- (h) Tables
- (i) Annexure
- (j) Bibliography

ROTATIONAL POSTINGS:

A. Intrinsic rotation:

Bacteriology	6 Months
Serology	6 Months
Mycobacteriology and Molecular	4 Months
Mycology	4 Months
Virology/ HIV	4 Months
Parasitology	4 Months
Media Preparation	2 Months
Hospital Infection Surveillance	2 Months

B. Extrinsic rotation (Mandatory allied postings)

Clinical Pathology	1 Month
Clinical Biochemistry	1 Month
Skin and VD	1 Month
ICTC/ RNTCP	1 Month

Suggested Reading

Core Books

- Text Book of Microbiology (vol I & II) Mackie & MacCartney
- Diagnostic Microbiology Bailey & Scot
- Text Book of Microbiology Ananthanaryan
- Text Book of Parasitology CP Baveja KD Chatteraji
- Review of Medical Microbiology Jawetz

Reference Books

- Microbiology and Microbial Infection (Vol I- VI)- Topley & Wilson
- Colour Atlas & Text Book of Diagnostic Microbiology- Koneman
- Immunology- Ivan Roitt
- Text Book of Mycology -Emmons
- Medical Virology- Fenner

Journals

- Indian Journal of Medical Microbiology
- Indian Journal of Medical Research
- Clinical Microbiological Reviews
- Journal of Hospital Infection
- Lancet
- North American Clinics of Infectious Diseases
- Review of Infectious Diseases
- Tuberculosis
- Indian Journal of Tuberculosis

Annexure-40B of AC-41/2021

MGM INSTITUTE OF HEALTH SCIENCES, NAVI MUMBAI
MARKLIST FOR PRACTICAL AND VIVA-VOCE EXAMINATION

EXAMINATION CENTRE:

COURSE / EXAM : PG

DATE OF EXAMINATION :

EXAMINATION FOR : M.D. (MICROBIOLOGY)

Seat No.	A	B							PRACTICAL / CLINICAL TOTAL (1+2+3+4+5+6+ 7)	C	Grand Total A+B+C
	LONG EXERCISE	SHORT EXERCISES								ORAL	
		1	2	3	4	5	6	7		VIVA VOCE and Dissertation	
	BACTERIOLOGY	Bacteriology Pure Culture	Virology & Molecular	Mycology	Parasitology	Serology	Identification Of Slides	Microteaching / Pedagogy			
	60 Marks	40 Marks	40 Marks	40 Marks	40 Marks	40 Marks	30 Marks	10 Marks	300 Marks	100 Marks	400 Marks

NAME OF EXAMINER	COLLEGE	SIGNATURE WITH DATE
1		
2		
3		
4		



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

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