PRAVARA INSTITUTE OF MEDICAL SCIENCES
(DEEMED TO BE UNIVERSITY)
Loni, Tal. Rahata, Dist. Ahmednagar 413736
NAAC Re-accrediated with 'A' Grade

SYLLABUS
PG Programme- Microbiology
(Competency Based Post Graduate Curriculum will be implemented from 2022, i.e. PG students batch admitted from 2021-22 onwards)

I. PREAMBLE:
The purpose of PG education is to create specialists who would provide high quality health care and advance the cause of science through research & training.
The purpose of preparing these Guidelines is to standardize Microbiology teaching at Post Graduate level throughout the country so that it will achieve uniformity in undergraduate teaching as well.
This document is to provide teachers and learners illustrative guidelines to achieve defined outcomes through learning and assessment. This document was prepared by various subject-content specialists. The Reconciliation Board of the Academic Committee has attempted to render uniformity without compromise to purpose and content of the document. Compromise in purity of syntax has been made in order to preserve the purpose and content. This has necessitated retention of "domains of learning" under the heading "competencies".

II. SUBJECT SPECIFIC OBJECTIVES
A post graduate student upon successfully qualifying in the MD (Microbiology) examination should be able to:

1. Demonstrate competence as a clinical microbiologist
2. Interact effectively with the allied departments by rendering services in basic as well as advanced laboratory investigations
3. Demonstrate application of microbiology in a variety of clinical settings to solve diagnostic and therapeutic problems along with preventive measures.
4. Play a pivotal role in hospital infection control, including formulation of antibiotic policy and management of biomedical waste.
5. Acquire skills in conducting collaborative research in the field of Microbiology and allied sciences.
6. Conduct such clinical/experimental research as would have significant bearing on human health and patient care
7. Demonstrate effective communication skills required for the practice of clinical microbiology and while teaching undergraduate students
8. Establish good clinical microbiological services in a hospital and in the community in the fields of bacteriology, virology, parasitology, immunology and mycology.
9. Plan, execute and evaluate teaching assignments in Medical Microbiology.
10. Plan, execute, analyze and present the research work in medical microbiology.
11. To acquire various skills for collaborative research.
12. To participate is various workshops/seminars/journal clubs/demonstration in the allied departments
13. Uphold the prestige of the discipline amongst the fraternity of doctors.

Post-graduate training

The post graduate training should include the following components for a holistic approach.

a) Clinical microbiology including Antimicrobial Resistance (AMR)
b) Laboratory and Diagnostic skills in Clinical Microbiology
c) Teaching Skills
d) Research Methodology
e) Communication and attitudinal skills
f) Infection prevention& central skills
g) Course in Ethics
h) Course in Cardiac Life Support Skills

a) Clinical Microbiology including Antimicrobial Resistance (AMR)

i) Should be able to elicit relevant history for optimum clinico-microbiological correlation with laboratory results.
ii) Should be able to perform basic physical examination and assess the patients with any suspected infection including community acquired infections and emerging and re-emerging infect ions.
iii) Should be able to formulate and critique diagnostic algorithms and patient care plans.
iv) Should be able to choose, interpret and communicate the results of appropriate microbiological investigation in a suspected infection.
v) Should be able to suggest optimal antimicrobial therapy, based on results of antimicrobial susceptibility tests and other investigations
vi) Should be able to advocate antibiotic stewardship for prevention and control of AMR (detailed competencies under AMRare given in Annexure I)
vii) Should be able to educate patients/relatives/community on various aspects of antimicrobial use, antimicrobial drug resistance, prevention and control of infections.

b. Laboratory and Diagnostic skills in Clinical Microbiology:

Based on the available facilities, the department should prepare a list of Post Graduate experiments pertaining to basic, diagnostic and applied Microbiology. Active learning should form the mainstay of the postgraduate training. There should be lectures for the postgraduate students (at least 10 per year) along with seminars/symposia/group discussions and journal clubs. The postgraduate student should also attend a minimum of 15 ward rounds, discuss with the faculty, and maintain a log book for the same. They should be able to render consultative and investigative services in microbiology.

c. Teaching Skills

The Medical Education Department/Unit of the institution should be able to sensitize the postgraduate students in basic concepts of medical education like domains of learning, teaching skills, teaching - learning methods, learning resource material, evaluation techniques etc. The postgraduate students should attend all undergraduate lectures in the subject of Microbiology and participate actively in the undergraduate teaching programme including tutorials, demonstrations and practicals.

d. Research Methodology

The postgraduate students should be able to plan, design and conduct research in microbiology, as well as collaborate with other departments, analyze data and become familiar with basic biostatistics. They should also be able to write a research paper. All this can be achieved by writing a thesis on a current and relevant topic in Microbiology.

e. Communication and attitudinal skills

The post graduate student should be able to communicate effectively with patients, their relatives, peers, and consultants for better clinical correlation of laboratory findings as well as research. They should work as an effective team member and leader. They should also demonstrate right kind of attitude while handling clinical material and reports.

f. Infection Prevention and Control

i. Should be able to demonstrate knowledge, skills & attitude required to detect, prevent and control health care associated infections of all types.
ii. Should be able to set up and manage Central Sterile Services Department (CSSD) and prepare effective sterilization and disinfection policy for the hospital.
iii. Should be able to demonstrate knowledge and skills about management of biomedical waste in health care setting as per recent guidelines and educate staff about risks, preventive measures and the management of occupational exposure to infectious agents.

g. course in Ethics

i) All post-graduate students shall complete course in ethics include including Good clinical practices and Good Laboratory practices, whichever is relevant to them, to be conducted by institutions/Universities.
ii) The students are expected to complete the course in the first year.
iii) No post-graduate student shall be permitted to appear in examination without the above certification.

h. Course in Cardiac Life Support Skills

i. All post-graduate students shall complete a course in Basic Cardiac Life Support (BCLS) and Advanced Cardiac Life Support (ACLS) skills to be conducted by institution.
ii. The students are expected to complete the course in the first year.
iii. No post-graduate student shall be permitted to appear in examination without the above certification.

III SUBJECT SPECIFIC COMPETENCIES

A) Predominant in Cognitive Domain (Knowledge):

At the end of the course, the student should have acquired knowledge in the following theoretical competencies:

<u>Paper – I</u> General Microbiology [GM & Immunology (IG)]

General Microbiology (GM)

1. Important historical events and developments in microbiology
2. Basic as well as advanced knowledge in various microscopes and microscopic techniques used in diagnostic microbiology

3. Various bio-safety issues including physical and biological containment, universal containment, personal protective equipment for biological agents
4. Various isolation precautions including standard and transmission based precautions
5. In-depth knowledge about various method of Sterilization, disinfection and lyophilization
6. Nomenclature, classification and morphology of bacteria as well as other microorganisms
7. Various types and significance of normal flora of human body in health and disease states.
8. Requirements for growth and nutrition of bacteria along with bacterial metabolism
9. Various types and role of bacterial toxins and bacteriocin
10. Microbiology of air, milk, water as well as hospital environment
11. Various types of host-parasite relationship and their significance
12. Various antimicrobial agents and mechanisms drug resistance
13. Bacterial genetics, bacteriophages and molecular genetics relevant for medical microbiology
14. Applications of quality assurance, quality control in microbiology and accreditation of laboratories
15. Explain various methods of isolation, identification and preservation of microbes in laboratory.
16. Explain the concept of microbiological surveillance including patient screening methods, organism typing and genome sequencing methodologies.
17. Describe the significance and causes / reasons regarding emerging infectious diseases with strategies for their identification and control.
18. Explain the concept and use of information technology (LIS, WHO NET etc) in microbiology laboratory effectively.
19. Explain the principles and application of recent technological advances, automation and application of artificial Intelligence, nanotechnology, biosensors, bio-informatics etc. in diagnosis and research in Microbiology.

Immunology (IG)

1. Components of immune system, types of immunity (Innate, acquired, mucosal, humoral and cell mediated immunity) and immune response
2. Describes and identifies uses of various antigens, immunoglobulins (antibodies) and antigen and antibody reactions
3. Complement system and Cytokines
4. Various disorders like hypersensitivity, immunodeficiency and auto-immunity involving immune system and discuss the laboratory methods use in their diagnosis including measurement of immunological parameters.
5. MHC complex, Immune tolerance, Transplantation and Tumor immunity
6. Various types, techniques, advances, and applications of vaccines and immunotherapyincluding UIP and immunotherapy and Reverse vaccinology
7. Measurement of immunological parameters
8. Immunological techniques and their applications in diagnostic microbiology as well as research
9. Mechanisms and significance of immune-potentiation and immune-modulation
10. Role of animal in Immunology.

PAPER II Clinical / Systemic Microbiology –I (CM –I)

i. Discuss in depth about the etiological agents, source, transmission, host-parasite interaction, clinical manifestations, laboratory diagnosis, treatment, prevention, epidemiology, national, international guidelines in the situations/ scenario given below:

- **Infections of various organs and systems of the human body**
  Microbiological basis of infective syndromes of various organs and systems of human body viz. CVS and blood, Respiratory Tract Infections, Urinary Tract Infections, Central Nervous System infections, Reproductive Tract Infections, Gastrointestinal Tract infections, Hepato-biliary System, Skin and Soft tissue infections, Musculoskeletal system, infections of Eye, Ear and Nose etc)

PAPER III: Clinical / Systemic Microbiology – II (CM-II)

I. Discuss in depth about the etiological agents, source, transmission, host-parasite interaction, clinical manifestations, laboratory diagnosis, treatment, prevention, epidemiology, national, international guidelines in the situations/ scenario given below:

- **Infectious diseases as per the source/risk**
- **Opportunistic Infections in special and high risk host**
- **Infections in special situations/ scenario**.

Microbiological basis of infective syndromes as per the source/risk e.g. Blood borne, Sexually transmitted infections congenital, vector borne, food, air & water borne, Zoonotic, laboratory acquired occupational infections etc. Opportunistic Infections inspecial and high risk host e.g Pregnancy, neonates, geriatrics, diabetics, immune compromised host due to any reason, patients with Implants/Devices, dialysis etc, Infections in special situations/ scenario -Tropical, Travel related, Emerging/ Remerging Infectious diseases seen commonly, agents of bioterrorism etc.

ii. Elicit relevant history, interpret laboratory results with clinic-microbiological correlation and develop diagnostic and treatment algorithms.

Following organisms (bacteria, fungi, virus and parasites) must be covered under clinical/systemic microbiology and the list must be updated to include newly identified microbes from time to time-

Bacteria:

1. Gram positive cocci of medical importance including Staphylococcus, Micrococcus, Streptococcus, anaerobic cocci etc.
2. Gram negative cocci of medical importance including Neisseria, Branhamella, Moraxella etc.

3. Gram positive bacilli of medical importance including Lactobacillus, Coryneformorganisms, Bacillus and aerobic bacilli, Actinomyces, Nocardia, Actinobacillus andother actinomycet, Erysipelothrix, Listeria, Clostridium and other spore bearinganaerobic bacilli etc.
4. Gram negative bacilli of medical importance including Enterobacteriaceae, Vibrios,Aeromonas, Plesiomonas, Haemophilus, Bordetella, Brucella, Gardnerella, Pseudomonas and other non-fermenters, Pasteurella, Francisella, Bacteroides, Fusobacterium, Leptotrichia and other anaerobic gram negative bacilli etc.
5. Helicobacter, Campylobacter, Calymmatobacterium, Streptobacillus, Spirillum andmiscellaneous bacteria
6. Mycobacteria
7. Spirochaetes
8. Chlamydia
9. Mycoplasmatales; Mycoplasma, Ureaplasma, Acholeplasma and other Mycoplasmas.
10. Rickettsiae, Coxiella, Bartonella etc.
11. Any newly emerging bacteria

Fungi:

1. Yeasts and yeast like fungi of medical importance including Candida, Cryptococcus,Malassezia, Trichosporon, Geotrichum, Saccharomyces etc.
2. Mycelial fungi of medical importance including Dermatophytes, Aspergillus, Zygomycetes, Pseudallescheria, Fusarium, Piedra, other dematiaceous hyphomycetesand other hyalohyphomycetes etc.
3. Dimorphic fungi including Histoplasma, Blastomyces, Coccidioides, Paracoccidioides,Sporothrix, Talaromycesmarneffei etc.
4. Fungi causing Mycetoma, Chromoblatomycosis, OcculomycosisOtomycosis, Phaeohyphomycosisetc
5. Pythium insidiosum
6. Prototheca
7. Pneumocystis jirovecii
8. Lacazialoboi (Loboaloboi)
9. Laboratory contaminant fungi
10. Fungi causing Mycetism and mycotoxicosis
11. Any newly emerging fungi

Virus:

1. DNA viruses of medical importance including Pox viruses, Herpes viruses, Adenoviruses, Hepadna virus, Papova and Parvo viruses etc.
2. RNA viruses of medical importance including Picorna viruses, Toga viruses, Flaviviruses, Orthomyxo viruses, Paramyxo viruses, Reo viruses, Rhabdo viruses, Arenaviruses, Bunya viruses, Retro viruses, Filo viruses, Human immunodeficiency virus,Arboviruses, Corona viruses, Calci viruses etc.
3. Oncogenic viruses

4. Bacteriophages
5. Slow viruses including prions
6. Unclassified viruses
7. Viriods
8. Any newly emerging virus

Parasite:

1. Protozoan parasites of medical importance including Entamoeba, Free living amoebae,Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium, Toxoplasma,Sarcocystis, Cryptosporidium, Cyclospora, Isospora, Babesia, Balantidium, etc.
2. Helminths of medical importance including those belonging to Cestoda (Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipylidium, Multiceps etc.),Trematoda (Schistosomes, Fasciola, Fasciolopsis, Gastrodiscoides, Paragonimus,Clonorchis, Opisthorchis etc.) andNematoda (Ascarislumbrecoides, Ancylostomaduodenale, Enterobiusvermicularis, Trichuristrichiura, Filariasis etc.)
3. Rhinosporidiumseeberi
4. Entomology: common arthropods and other vectors viz. mosquito, sand fly, ticks, mite,cyclops, louse, myasis etc.
5. Neglected tropical parasitic diseases
6. Any newly emerging parasite

Paper IV: Applied Microbiology (AM) & Recent Advances:

Student should be able to apply knowledge & comprehension about following applied aspects:

i**. Prophylaxis -** Basic Principles and applications of general, immune as well aschemo- prophylaxis of infections in various clinical situations / scenarios.

ii. **Vaccinology:** types of vaccines, principles, methods of preparation of vaccines andadministration of vaccines.

iii. **Health care associated Infections -** types, pathogenesis, diagnosis, prevention,control and surveillance of health care associated infections.

iv. **Biomedical waste and its management**.

v. **Role of microbes in non-communicable diseases -** infectious agents in origin andprogression of non-communicable diseases like cancer, diabetes, musculoskeletaldisorder and influence of these microbes on mental health.

vi. **Antimicrobial Resistance Detection and Prevention**: classification, mechanism ofaction, detection and reporting drug resistance to antimicrobials (antibacterial,antiviral, antifungal, antimycobacterial and antiparasitic agents).

vii. Investigation of an infectious disease outbreak in hospital andoutbreak/epidemic/pandemic in community.

viii. Information technology (computers) in microbiology.

ix. Automation in Microbiology.

x. Molecular techniques in the laboratory diagnosis of infectious diseases.

xi. Statistical analysis of microbiological data and research methodology.

xii. Animal and human ethics involved in microbiological work.
xiii. Laboratory safety and management.

B. Predominant in Affective Domain

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
2. Always adopts ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and students for effective teaching.

C) Psychomotor domain:

1. Collection/transportation of specimens for microbiological investigations
2. Preparation, examination and interpretation of direct smears from clinical specimens
3. Plating of clinical specimens on media for isolation, purification, identification and quantification purposes.
4. Preparation of stains viz. Gram, Albert's, Ziehl-Neelsen (ZN), Silver impregnation stain and special stains for capsule and spore etc.
5. Preparation and pouring of media like Nutrient agar, Blood Agar, MacConkey agar, Sugars, Kligler iron agar/Triple sugar iron agar (TSI), Robertson's cooked meat broth, Lowenstein Jensens medium, Sabouraud's dextrose agar etc.
6. Preparation of reagents-oxidase, Kovac etc.
7. Quality control of media, reagents etc.
8. Operation of autoclave, hot air oven, filters like Seitz and membrane filters etc
9. Care and operation of microscopes
10. Washing and sterilization of glassware (including plugging and packing)
11. Care, maintenance and use of common laboratory equipments like autoclave, hot air oven, water bath, centrifuge, refrigerators, incubators etc.
12. Aseptic practices in laboratory and safety precautions. Selection of Personal Protective Equipment according to task and donning (gloves, mask, eye protection, gown etc).
13. Sterility tests
14. Identification of bacteria of medical importance up to species level (except anaerobes which could be up to generic level).
15. Techniques of anaerobiosis
16. Tests for Motility: hanging drop, Cragie's tube, dark ground microscopy for *spirochaetes*
17. Routine and Special tests - Catalase test, Oxidase test, slide and tube coagulase tests, niacin and catalase tests for *Mycobacterium*, bile solubility, chick cell agglutination, sheep cell haemolysis, satellitism, CAMP test, and other biochemical tests.
18. Preparation of antibiotic discs; performance of antimicrobial susceptibility testing eg. Kirby-Bauer, Stoke's method, Estimation of Minimal Inhibitory/Bactericidal concentrations by tube/plate dilution methods.
19. Tests for ß-lactamase production.

20. Screening of gram negative isolates for ESBL and MBL
21. Screening of *Staphylococci* for Methicillin Resistance.
22. Screening of *Enterococci* for Vancomycin resistance.
23. Testing of disinfectants.
24. Quantitative analysis of urine by pour plate method and semi quantitative analysis by standard loop tests for finding significant bacteriuria
25. Disposal of contaminated materials like cultures
26. Disposal of infectious waste
27. Bacteriological tests for water, air and milk
28. Maintenance and preservation of bacterial cultures

- **Time frame to acquire knowledge & skills:**

o **<u>Knowledge :</u>**

End of 1st year	**End of 2nd year**	**End of 3rd year**
GENERAL MICROBIOLOGY: 1 History and Pioneers in	**IMMUNOLOGY :Clinical** 1. Hypersensitivity 2. Immunodeficiency	**GENERAL MICROBIOLOGY& IMMUNOLOGY:**

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	3. Auto-immunity 4. Immune tolerance 5. Transplantation immunity 6. Tumor immunity 7. Immunoprophylaxis and immunotherapy 8. Measurement of immunity	**All**
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		

IMMUNOLOGY :	**SYSTEMATIC BACTERIOLOGY**	**SYSTEMATIC BACTERIOLOGY (2nd year) : plus**
1 Innate and acquired immunity 2 Antigens 3 Immunoglobulins	1 Streptococcus and Lactobacillus 2 Staphylococcus and Micrococcus 3 Pseudomonas	1 ActinomycetesNocardia and Actinobacillus 2 Erysipelothrix and Listeria 3 The Bacteroidaceae:

		Bacteroides, Fusobacterium and Leptotrichia
4 Antigen and antibody Reactions	4 The Enterobacteriaceae	4 Chromobacterium, flavobacterium, Acinetobacter and Alkaligenes
5 Complement System	5 Mycobacteria	5 Pasteurella, Francisella
6 The normal immune system: structure and function	6 Corynebacterium and other Coryneform bacteria	6 Brucella
7 Immune Response	7 Vibrios, Aeromonas, Plesiomonas, Campylobacter & Spirillum	7 Chlamydia
	8 Neisseria, Branhamella& Moraxella	8 Rickettsiae
	9 Haemophilus and Bordetella	9 Mycoplasmatales: Mycoplasma, Ureaplasma and Acholeplasma
	10 Bacillus: the aerobic spore-bearing bacilli	10 Miscellaneous Bacteria
	11 Clostridium: the spore-bearing anaerobic bacilli	
	12 Non-sporing anaerobe	
	13 The Spirochaetes	

MICROBIOLOGY APPLIED TO TROPICAL MEDICINE AND RECENT ADVANCES 1. Normal Microbial Flora 2. Epidemiology of Infectious Diseases 3. Hospital acquired infections & Hospital waste Disposal 4. Bacteriology of water milk and Air	**VIROLOGY:** 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. Herpes viruses* *11. Paramyxoviruses* *12. Influenza virus* *13. Hepatitis viruses* *14. Rabies virus* **15.** *Human immunodeficiency Viruses*	**VIROLOGY (2nd year): plus** 1. Vaccines *2. Pox viruses* *3. Vesicular viruses* *4. Toga viruses* *5. Bunya viruses* *6. Arena viruses* *7. Marburg and Ebola viruses* *8. Rubella virus* *9. Orbi viruses* 10. Respiratory diseases : *Rhinoviruses, adenoviruses* and *corona viruses* 11. Enteroviruses; *Polio, Echo, and Coxsackie viruses* 12. Other enteric viruses 13. Slow viruses 14. Oncogenic viruses 15. Teratogenic Viruses
	PARASITOLOGY: **1.** General Parasitology *2.* **Protozoan parasites of medical importance:** *Entamoeba, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium*	**PARASITOLOGY (2nd year): plus** **1. Protozoan parasites of medical importance:** *Toxoplasma, Sarcocystis, Cryptosporidium, Babesia, Balantidium*etc. **2. Helminthology:** All those medically important helminthes belonging to Cestoda, Trematoda and Nematoda. **3. Cestodes:** *Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipyllidium,*

		Multicepsetc. **4. Trematodes:** *Schistosomes, Fasciola, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis*etc. **5. Nematodes:** *Trichuris, Trichinella, Strongyloides, Ancylostoma, Necator, Ascaris, Toxocara, Enterobius, Filarial worms, Dracunculus*, etc. 6. **Ecto-parasites:** Common arthropods and other vectors viz., Mosquito, Sand fly, Ticks, Mite, Cyclops
	MYCOLOGY 1. The Morphology and reproduction in fungi *2* Classification of fungi *3. Dermatophytes* *4. Candida* 5. *Aspergillus*	**MYCOLOGY (2nd year): plus** 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 **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 gel electrophoresis – principles 5. Ultracentrifugatio n – principles 6. Column chromatography – principles **(b) Molecular biology:** Basicknowledge as applicable to molecular diagnostics and molecular epidemiology. 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 **(c) Pathology: (as applied to Microbiology)** Basic knowledge of 1. Inflammation and repair 2. Intercellular substances andreaction 3. Pathological changes in the body in bacterial, viral, mycotic and parasitic infections 4. Demonstration of pathogen in tissue section

- **SKILLS:**

1st 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 *M.leprae*	5	5	5
	5	Modified ZN staining for*Nocardia*	5	5	5
	6	IQC-staining	5	5	5
Media	1	Preparation of stains	4	4	4
Preparation	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 *C. parvum*	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

2nd 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 *M. Leprae*	--	--	5
	5	Modified ZN staining for *Nocardia*	--	--	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 *C. Parvum*	--	--	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 *M. Leprae*	--	--	5
	5	Modified ZN staining for *Nocardia*	--	--	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 *C. Parvum*	--	--	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

2. *SYLLABUS*

Course contents:
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. Immunopotentiation and immunomodulation

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, Coryneformorganisms, 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 dematiaceoushyphomycetes and other hyalohyphomycetes etc.
7. Dimorphic fungi including Histoplasma, Blastomyces, Coccidioides, Paracoccidioides, Sporothrix, Penicilliummarneffei etc.
8. Dermatophytes
9. Fungi causing Mycetoma, Chromoblatomycosis, Occulomycosis and Otomycosis.
10. Pythiuminsidiosum
11. Prototheca
12. Pneumocystis jirovecii infection
13. Rhinosporidiumseeberi and Lacazialoboi (Loboaloboi)
14. Laboratory contaminant fungi
15. Mycetism and mycotoxicosis
16. Antifungal agents and in vitro antifungal susceptibility tests.

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, Adeno viruses, 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 immunodeficiency virus, Arbo viruses, Corona viruses, Calci viruses etc.
10. Slow viruses including prions
11. Unclassified viruses
12. Hepatitis viruses
13. Viriods, 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, CyclosporaIsospora, Babesia, Balantidium, etc.
4. 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 (etc.)
5. Entomology: common arthropods and other vectors viz. mosquito, sand fly, ticks, mite, cyclops, louse, myasis.
6. Anti-parasitic agents.

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

3. TEACHING AND LEARNING METHODS

The training programme should be designed to enable the student to acquire a capacity to learn and investigate, to synthesize and integrate a set of facts and develop a faculty to reason. The curricular programme and scheduling of postings must provide the student with opportunities to achieve the above broad objectives. Much of the learning is to be accomplished by the student himself. Interactive discussions are to be preferred over didactic sessions. The student must blend as an integral part of the activities of an academic department that usually revolves around three equally important basic functions of teaching, research and service. As mentioned earlier, the emphasis recommended under a residency programme is of learning while serving/working.

Post Graduate Training programme

Teaching methodology

Based on the available facilities, the Department can prepare a list of post graduate experiments pertaining to basic and applied microbiology. Active learning should form the mainstay of post graduate training; there should be lectures for post graduates (at least 10 per year), along with seminars, symposia, group-discussions and Journal clubs. The post graduate students should regularly do the ward rounds of various clinical departments and learn cases of interest for discussion with the clinical faculty. Each college should have a Medical Education Unit to generate teaching resource material for undergraduates and evolving of problem solving modules.

Rotation:

Postings to laboratories/assignments

The three-year training programme for the MD degree may be arranged in the form of postings to different assignments/laboratories for specified periods as outlined below. The period of such assignments/postings is recommended for 35 months. Posting schedules may be modified depending on needs, feasibility and exigencies. For facilities not available in the parent institution as well as for additional knowledge and skill, extramural postings may be undertaken.

Suggested schedule of rotation:

Within Department

1. Bacteriology
2. Mycobacteriology
3. Serology/Immunology
4. Mycology
5. Virology
6. Parasitology
7. Media preparation
8. Molecular Lab – a) PCR / RTPCR
   b) CBNAAT

Other Departments

1. Clinical Pathology
2. Clinical Biochemistry
3. Skin & VD
4. ICTC & RNTCP
5. District Residency Programme

Practical training

Practical training should be imparted by posting the students in various sub-specialties (sections) as detailed in the intrinsic and extrinsic rotation. The student should be actively involved in day to day working of all the sections. He/she should be trained under the guidance of teachers in all the aspects of Clinical Microbiology and applied aspects of laboratory medicine including collection and transport of specimens, receiving of samples, preparation of requisite reagents, chemicals, media and glassware, processing of specimens, performing required antimicrobial susceptibility testing and reporting on the specimens, interpretation of results, sterilization procedures, bio-safety precautions, infection control practices, maintenance of equipments, record keeping and quality control in Microbiology.

Skills & performance

The student should be given graded responsibility to enable learning by apprenticeship. The faculty throughout the year should assess performance of the student in skills. Area of improvement/remarks should be mentioned for the skill and student should be re-assessed for the skills which are not acquired. To go to the next level, it should be mandatory for the student to acquire lower level skills satisfactorily, i.e only on satisfactory completion of assisted/performed with assistance skills should the student be permitted to perform the skill independently.

Infection Prevention and Control Skills-

i.Hand hygiene skills

ii. Donning and doffing of PPE

iii. Transmission based precautions in patient care

iv. Segregation and disposal of biomedical waste in laboratory and hospital
v. Handling of sharps
vi. Post-exposure prophylaxis when exposed to blood and body fluids
vii. Spillage management
viii. Sterilization policy of environment and devices in the hospital as per the latest guidelines.
ix. Calculation of HAI infection rates.
x. Plan & conduct HAI surveillance & infection control audits
Emergency duty

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

Training in research methodology

Training in research methodology should be imparted by planning of a research project by the student under the guidance of a recognized guide to be executed and submitted in the form of a thesis.

The thesis is aimed at training the post graduate student in research methods and techniques. It should include identification of a research question, formulation of a hypothesis, search and review of relevant literature, getting acquainted with recentadvances, designing of research study, collection of data, critical analysis of the results and drawing conclusions. The thesis should be completed and submitted by the student six months before appearing for the final university examination.

Communication and attitudinal skills

Post-graduate student is expected to imbibe professional attributes of honesty, integrity, accountability, honour, humanism and excellence and demonstrate the same in the day-by-day conduct and dealings with the teacher, peers, the nursing and paramedical staff and most-importantly patients. To ensure that student is able to acquire these attributes, their personal conduct should be keenly observed by the teachers and student should be counselled as and when required. Personal attributes of the student should be regularly assessed by peers, senior and junior students and Head of the Unit/ In charge.

The following is a rough guideline to various teaching/learning activities that may be employed.

- Collection of specimens, smear examination, culture and sensitivity analysis
- Discussion during routine activities such as during signing out of cases.
- Presentation and work-up of cases including the identification of special stains and ancillary procedures needed.
- Clinico-microbiological conferences, active involvement with hospital infection control committee
- Intradepartmental and interdepartmental conferences related to case discussions.
- Conferences, Seminars, Continuing Medical Education (CME) Programme.

- Journal Club.
- Research Presentation and review of research work.
- A postgraduate student of a postgraduate degree course in broad specialties/super specialties would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.
- Participation in workshops, conferences and presentation of papers etc.
- Laboratory work.
- Use and maintenance of equipment.
- Maintenance of records. **Log books** should be maintained to record the work done which shall be checked and assessed periodically by the faculty members imparting the training.
- Postgraduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.
- Department should encourage e-learning activities.

During the training programme, patient safety is of paramount importance, therefore, skills are to be learnt initially on the models, later to be performed under supervision followed by performing independently; for this purpose, provision of skills laboratories in medical colleges is mandatory.

Table:1. Following is the suggested plan of Rotation for Postgraduate students Postings to Diagnostic Laboratories/Hospital/ Community

Sr no	Schedule of Rotation	Duration Suggested	Specific Learning Objectives
1	Microbiology laboratory i. Different sections of Bacteriology ii. Mediapreparation iii. Mycobacteriology iv. Serology/Immunology v. Mycology vi. Virology vii. Parasitology viii. Molecular lab ix. Hospital Infection Control including BMWmanagement	Distributed in various section depending upon training& departmental needs	• As per the specific objectives in each section, a student is expected to acquire skills from basic to the most recent ones in diagnostic microbiology.
2.	Sample Collection area	Two weeks	• To learn pre-analytical parameters &procedures at sample collectionarea. • To communicate effectively with patientsat sample collection area. • Learn to demonstrate respect, empathy &confidentiality when dealing with patients,samples and reports. • Demonstrate leadership skills in managingthe functioning of the lab (staffmanagement, preparing duty roster)

3.	Clinical Pathology i. Hematology ii. Histopathology iii. Blood Bank	Two weeks	• Basic knowledge of clinical pathology (as applied to Microbiology) • Inflammation and repair • Intercellular substances and reaction • Pathological changes in the body inbacterial, viral, mycotic and parasiticinfections Clinical Pathology skills: • Peripheral smear examination • CBC interpretation • Urine examination • Pathological investigations and theirSignificance in infectious diseasediagnosis. Blood Bank skills: • Transfusion transmitted infection Blood grouping • Screening of blood & blood donors • Counseling skills Histopathology skills: • Various stains and staining techniques used in histopathological examination of infectious agents • Identification of pathogen and/or pathological changes in tissue sections in Infectious diseases.
4	Clinical Biochemistry	One week	
5	ICTC /PPTCT/ART	Two weeks	
6	Tuberculosis and RNTCP	Two weeks	
7	District hospital postings (mandatory) 3rd or 4th semester for 3 months	Three months*	
8	**Emergency / casualty posting**	One Month Posting to bedone	Depending on the area of posting- History taking and physical examination Skills • Sample collection and Transportationskills • Identification of common infections andmake a differential diagnosis • Choose the appropriate Laboratoryinvestigations required for confirmation of diagnosis • Interpret the laboratory results andcorrelate them clinically. • Learn common treatment plan,particularly choice of antimicrobials and identify factors that influence choice ofantimicrobials. • Acquire reasoning and critical

			thinkingrequired in decision making when dealing with an infectious disease case • Infection control practices

*Posting under "District Residency Programme"

All postgraduate students pursuing MD/MS in broad specialties in all Medical Colleges/Institutions shall undergo a compulsory rotation of three months in District Hospitals/District Health System as a part of the course curriculum, as per the Postgraduate Medical Education (Amendment) Regulations (2020). Such rotation shall take place in the 3 rd or 4 th or 5 th semester of the Postgraduate programme and the rotation shall be termed as "District Residency Programme" and the PG medical student undergoing training shall be termed as "District Resident".
Depending upon the objectives to be achieved, feasibility and availability of resources, the rotational postings can be within the hospital or outside the hospital.

During the clinical posting, opportunities to present and discuss infectious disease cases through bedside discussion and ward/grand rounds with clinicians in different hospital setting must be scheduled.

The PG student must be tagged along with the resident of the clinical department for bedside case discussion, under the guidance of an assigned faculty. A minimum of five case histories shall be recorded by a student during course of study. The case history must be representative of different type of Infectious Disease (ID) cases likely to be encountered eg., those caused by different microbes in community and hospital setting, HAI, infections in critical care/ ward 28 setting, infection in different age groups, infections in special host like Immunocompromised host, traveler, specific occupations etc.

The process of recording case histories can begin in first half of 2nd year of PG program, after students have learnt about various infective syndromes. The severity and complexity of cases must progress gradually, with simple community-based infection to begin with. At least one fourth of the cases recorded must have been discussed with the ID specialist or a clinician and their feedback/remarks documented in log book/ portfolio with their signatures.

Documentation of students learning at the end of each posting is required.

Emergency duty

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

Leave Rules for Post-graduate Students - The following leave rules will be followed:

a) Every post-graduate student will be given minimum 20 days of paid leave (casual leave) per year.
b) Subject to exigencies of work, post-graduate students will be allowed one weekly holiday.
c) Female post-graduate students shall be allowed maternity leave as per existing Government rules and regulations.

d) Male post-graduate students shall be allowed paternity leave as per existing Government rules and regulations.
e) In addition to 20 days' paid leave, the candidates will be allowed academic paid leave of 5 days per year.
If candidate avails leave in excess of the permitted number of days, his/her term of course shall be extended by the same number of days to complete the training period

4. ASSESSMENT

FORMATIVE ASSESSMENT, i.e., assessment during the training

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self-directed learning and ability to practice in the system.

General Principles

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and practical/clinical examination.

Quarterly assessment during the MD programme should be based on:

1. **Journal based / recent advances learning**
2. **Laboratory or Skill based learning**
3. **Self-directed learning and teaching**
4. **Departmental and interdepartmental learning activity**
5. **External and Outreach Activities / CMEs**

The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure II).

SUMMATIVE ASSESSMENT, i.e., assessment at the end of training

The summative examination would be carried out as per the Rules given in**POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000.**

The post-graduate examinations should be in three parts:

1.Thesis.

Every post graduate student shall carry out work on an assigned research project under the guidance of a recognized Post Graduate Teacher, the result of which shall be written up 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 thepost graduate 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 Theory 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 Clinical examination. A post graduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

Essential pre-requisites for appearing for examination include:

1. Attendance- 80% (eighty per cent)
2. Log book/ E-log book of work done during the training period including rotation postings, departmentalpresentations and internal assessment reports should be submitted.
3. At least one poster OR oral presentation at national level conference OR one research paper should bepublished / accepted in an indexed journal. (It is suggested that the local or UniversityReview committee assess the work sent for publication).
4. REQUIRED CERTIFICATES:
   I. Course in Research methodology
   II. Course in Ethics
   III. Course in cardiac life support- basic and advanced cardiac life support
   IV. District residency programme
   V. Clinical emergency/ Casualty
5. Thesis

The summative examination would be carried out as per the Rules given in the latest POSTGRADUATE MEDICAL EDUCATION REGULATIONS. The theory examination shallbe held in advance before the Practical examination, so that the answer books can beassessed and evaluated before the commencement of the Practical and Oral examination.

2. Theory Examination

The examinations shall be organized on the basis of ‘Grading’ or ‘Marking system’ to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in ‘Theory’ as well as ‘Practical’ separately shall be mandatory for passing examination as a whole. The examination for M.D./ MS shall be held at the end of 3rd academic year. An academic term shall mean six month's training period

CRITERIA FOR EVALUATION OF M.D

SR. NO	Description	M.D
1	THEORY	
	No. of Theory Papers	4
	Marks for each Theory Paper	100
	Total marks for Theory Paper	400
	Passing Minimum for Theory	200/400 (40% minimum in each paper)
2	PRACTICAL	300
3	VIVA VOCE	100
	Passing minimum for Practical including Viva voce	200/400
	The candidate shall secure not less than 50% marks in each head of passing which shall include (1) Theory-aggregate 50% (In addition, in each Theory paper a candidate has to secure minimum of 40%) (2) Practical and Viva voce-aggregate 50% (3) If any candidate fails even under one head, he/she has to re-appear for both Theory and Practical/Clinical and Viva voce examination. (4) Five per cent of mark of total marks of Practical and Viva Voce marks **(20 marks)** will be of **dissertation/thesis a**nd it will be part of practical examination marks. External examiner outside the state will evaluate dissertation/ thesis and take viva voce on it and marks will be given on quality of dissertation/thesis and performance on its viva voce (5) No grace mark is permitted in post-graduate examination either for theory or for practical.	

There shall be four theory papers (as per PG Regulations).

Paper I- General Microbiology and Immunology (GM & IG).
Paper II– Clinical / Systemic Microbiology (CM I).
Paper III– Clinical / Systemic Microbiology (CM II).
Paper IV- Recent Advances & Applied Microbiology (AM).

Universities shall prepare a blueprint for assessment of competencies and ensure 60-70% Weightage is given to higher levels in Blooms taxonomy (application and above) in theory with more number of clinical scenario based questions. In Paper II/III (CM – II/III) –distribution of Clinical Scenarios testing the ability of a student to deal with infections caused by

3. Practical and Oral/viva voce Examination

Practical should be spread over **two** days and include the following components:

- **Bacteriology:**

1. Identification of a pure culture.
2. Isolation and Identification of Bacteria from Clinical Samples

- **Serology:**

Common Serological Tests like ELISA/VDRL/Widal/Brucella Agglutination test etc.

- **Virology:**

1. Preparation of tissue cultures
2. Virus Titration
3. Haemagglutination and its inhibition test
4. Virus Neutralization Test
5. Other rapid tests for diagnosis of viral infections

- **Mycology**
  1. Identification of fungal cultures
  2. Slide culture techniques
  3. Examination of histopathology slides for fungi

- **Parasitology**
  1. Processing and Identification of ova and cysts in stool samples
  2. Amoebic Serology
  3. Microscopic Slides
  4. Examination of histopathology slides for parasites
  5. Spots: 10 spots

Oral/Viva-Voce Examination:
This must include a component of teaching session of not more than 15 minutes duration.

Course:- Microbiology (MD) **Marks: 400**

Note: Scratching or over writing not allowed

Seat No.	Long exercise Bacteriology (70)	Bacteriology short exercise (40)	Mycobacteriology/ Special staining (10)	Virology-exercise (20)	Immunology exercise (20)	Mycology exercise (30)	Parasitology exercise (30)	Serology exercise (20)	Identification of Slide (20)	Microteaching/ pedagogy (20)	Dissertation/ Thesis (20)	Oral/ Grand viva (100)	Practical total =400 Max=400 Min= 200

20

5. *MANDATORY COMPLIANCE*

1	Following are the competencies to be achieved under Antimicrobial Resistance Detection and Prevention:		**Annexure – I**
2	The Model Weekly Time Table for Teaching learning activities is enclosed as	**:**	**Annexure – II**
3	Mandatory compliance of a PG student in T.L. process and CIA during the three year of study are given in	**:**	**Annexure – III**
4	The units for Quarterly assessment for CIA is given in	**:**	**Annexure – IV**
5	Post Graduate student Quarterly Appraisal form for CIA is enclosed as	**:**	**Annexure – V**
6	Mandatory Requirements to be eligible to appear for the University Summative Evaluation Examination is given in	**:**	**Annexure – VI**
7	The Proforma of the Certificate on Attendance, Training Completion, Publication and Presentation Research / Poster / oral submission of Dissertation and present of all theory practical fee to be duly filled in and duly signed by PG Guide HOD, Finance Officer, Dean of faculty an HOI to be submitted to university COE before the issue of Hall Ticket for final exam is given us	**:**	**Annexure – VII**
8	The model QP pattern of paper I/II/III/IV, each of 100 marks and of 3 hours duration is enclosed as	**:**	**Annexure – VIII**
9	The model Blue print for setting of Question papers and proper verbs/ phrases to be used in QP setting is given in	**:**	**Annexure – IX**
10	The model marks list for practical and Vivavoce for PG medical MD/MS/ examination is enclosed as**.**	**:**	**Annexure – X**

6. RECOMMENDED READING:

Books (Latest edition)

1. Forbes B, Sahm D, Weissfeld A. Bailey and Scott's Diagnostic Microbiology, Mosby, St. Louis.
2. Koneman EW, Allen SD, Janda WM, Schreckenberger PC, Winn WC. Color Atlas and Textbook of Diagnostic Microbiology, J.B. Lippincott, Philadelphia.
3. Murray PR, Baron EJ, Pfaller MA, Tenover FC, Yolken RH. Manual of Clinical Microbiology, American Society for Microbiology.
4. Garcia LS, Bruckner DA. Diagnostic Medical Parasitology, American Society for Microbiology.
5. Wiedbrauk DL, Johnston SLG. Manual of Clinical Virology, New York, Raven Press.
6. Bailey and Scott's Diagnostic Microbiology.

Journals

03-05 international Journals and 02 national (all indexed) journals

Annexure I

Following are the competencies to be achieved under Antimicrobial Resistance Detection and Prevention:

1. Demonstrate in depth knowledge of classification, mechanism of action and drug resistance of antimicrobials (anti-bacterials, antiviral, antifungal, anti-mycobacterial and anti-parasitic agents).
2. Explain various phenotypic and genotypic methods used in laboratory for detection of drug resistant strains and their implications in patient care.
3. Demonstrate skills in performing antimicrobial susceptibility testing with calculations of MIC/MBC by various phenotypic and genotypic methods and interpret results as per standard guidelines (CLSI, EUCAST etc).
4. Detect and report bacterial drug resistance by identification of the commonly isolated drug resistant strains (MRSA, VRSA, VRE, CRE, MBL, AMP-C etc) and choose the most appropriate agent for therapeutic use in a specific clinical scenario.
5. Explain the implications of AST result on antimicrobial therapy to clinicians/colleagues.
6. Communicate effectively with clinicians to guide and create an antimicrobial treatment plan based on organism identification and susceptibility test.
7. Explain the concept of narrow/broad spectrum of antimicrobials, PK/PD parameters and their significance on response to antimicrobial therapy.
8. Explain significance of monitoring of antimicrobial therapy in patient care.
9. Explain the concept of empiric, syndromic and culture-based treatment strategies for treating infections.
10. Explain the need to de-escalate from empirical broad-spectrum therapy to targeted narrow-spectrum therapy.
11. Explain the importance of appropriate use of antimicrobial agents, risk of antimicrobial resistance and spread of AMR in the health care environment and the community.
12. Explain the concept of normal microbial flora, colonization, contamination and infection with its role in deciding antimicrobial therapy. 40
13. Demonstrate knowledge about antimicrobial prophylaxis including peri-operative surgical prophylaxis regimens.
14. Describe the concept of first-, second- and third-line antimicrobial therapy for infections.
15. Explain the importance of restricted reporting of susceptibility data by the laboratory to control antimicrobial use.
16. Explain the concept and application of WHO tool for optimizing use of antimicrobial agents: Access, Watch and Reserve (AWaRe).
17. Explain the importance of antimicrobial formularies, consumption data and prescribing policies and processes to monitor use of antimicrobials in hospitals.
18. Effectively use information technology (LIS, WHO NET etc.) for data collection and surveillance of AMR in microbiology laboratory.
19. Explain significance of collecting local antimicrobial resistance data and its use in deciding direct empirical antimicrobial therapy.
20. Demonstrate knowledge and skills to develop antibiotic policy by using local AMR data in hospital.

21. Explain significance of adherence to antibiotic policy and antibiotic stewardship program.
22. Be a part of antimicrobial stewardship team for the institution.
23. Demonstrate knowledge about recent published guidelines that recommend antimicrobial treatment therapy in various clinical situations.
24. Effectively communicate with the patients/ relatives about the role of antimicrobial agents in their disease and advice on appropriate use.
25. Actively engage with patients, relatives and the community to advise on the role of antimicrobial agents in therapy and the threat of resistance.
26. Participate in clinical audit and quality improvement programmes relating to antimicrobial use.
27. Teach students, colleagues and other health professionals regarding antimicrobial use and resistance

Annexure - II

P.G. Teaching Time Table – Model

Clinical postings (OPD – IPD Duties Ward Rounds, Casualty posting, ICU posting, posting to support Departments like Radiology, Anaesthesia CCL , Pathology, FMT, Postings to field work and PHCs Camps and other postings as per provisions of MCI, are mandatory on all week Day as per posting.

Day of the week	Time 03 to 5 PM
Monday	Journal Club
Tuesday	Case presentation / Micro Clinic- Patient based Training
Wednesday	Seminar / GD / Panel Discussion
Thursday	Lecture by Faculty on select Topics
Friday	Clinical Meet / CPC / CME
Saturday	Guest Lecture by Experts / Skill Lab or Simulation Lab
Sunday (Select ones)	Medical Camps / Blood Donation Camp / Other types of Camps

Note

1. The Dept may select suitable days for a particular task assigned. But all of 7 tasks per week are a must
2. All the PG Teachers, PG students must attend these PG TLE Activities.
3. Attendance for these activities shall be maintained at the Department and Institutions. Implementation of the MCI Regulations, Syllabus and Time Table is the responsibility of HOD / HOI.

HOD HOI DEAN OF FACULTY REGISTRAR

Annexure – III

Mandatory Compliance of a PG student in Teaching – Learning Activities As per MCI Regulations Syllabus and Advisory

Sr. No.		Activities to be carried at by a PG student	Number per Ist year (Minimum)	Number Per IInd Year (Minimum)	Number per IIIrd year (Minimum)	Total Number (Minimum) For 3 years
1		Presentation of Journal Articles in Journal club	12	12	6	30
2	a	Case Presentation / Clinic	4	8	8	20
	b	Skill Lab & Simulation	4	4	4	12
3	a	Presentation of Seminars	4	4	4	12
	b	Leading a Group Discussion on a select Topic	4	4	4	12
	c	Assignment submission	4	4	4	12
4	a	Lectures / Tutorials to UG students /panel Discussion	4	4	4	12
	b	Clinical meeting CMC/ CPC	12	12	12	36
	c	BLS	1	--	--	1
	d	ACLS	1	--	--	1
5		Medical Camps Health Checkup at Villages / Schools/ Blood Donation / etc.	6	6	6	18
6	a	Orientation Programme	1	1	1	3
	b	Research Methodology Workshop	1	--	--	1
	C	Presentation of synopsis of the Thesis / Dissertation	1	--	--	1
	d	Presentation of Mid Term work of Thesis / Dissertation	--	1	--	1
	e	Presentation of final Draft of Dissertation / Thesis	--	--	1	1
	f	Presentation of Research Article	--	0 or 1	0 or 1	1
	g	Publication of an Article	--	0 or 1	0 or 1	1 or 2
7		LOG Book	1 (a)	1 (b)	1 (c)	1 a+b+c
8		CIA	4	4	4	12
9		Any other Activity Specified by Dept.				

Note :- 1. The Department may conduct periodic preparatory tests in Theory / Practical/Clinicals and Vivavoce. Quiz and MCQ test may to be adopted

2. The 12th CIA may also include a preparation examination on the model of university examination as a training cum assessment

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Annexure – IV

Units of Quarterly Assessment of Every student (Internal)

Formative Assessment – Quarterly Assessment (Total 12 CIAs)

As per Annexure III.

1. **Journal Based / Recent Advances learning**
   (Bases on Journal Clubs / Select Article Presentation , Review Article preparation and presentation)
2. **Patient Based and Laboratory Based and skill Based learning**
   (Based on clinical Posting – OPD / IPD Ward Rounds/ casualty/ Case Examination/ presentation /Diagnosis / Interpretation /of Clinical Diagnostics/ Differential Diagnosis, Prognosis/ Morbidity/ Mortality/ Community Medicine/ Promotion/ prevention/ Control/ Prophylaxis/ Epidemiology/ Simulation Studies/ Skill Based Studies and so on)
3. **Self Directed Learning and Teaching**
   (Seminars Panel Discussion Group Discussion, Assignments, Case studies, Preparation of Charts and Models etc. , Role Play, Debates, Moot courts, etc)
4. **Departmental and Inter Departmental Learning Activities.**
   (Participation in UG/PG teaching / Horizontal and Vertical Integrated Lectures, Clinical meeting / CPC / CME)
5. **External and out research Activities**
   (Participation in Camps, Posting and Visit to PHCs, Satellite clinics, Mobile Clinics, Health checkup Camps, Blood Donation Camps, Immunization Camps school Visits. Crisis / Disaster Management, Celebration of Commemorative Days and soon)
6. Thesis / Dissertation Research Work related to selected Topic
7. a) Log Book maintenance/ Portfolio management - To maintain LOG Book or portfolio management of all the TL Activities
   b) Presentation / Publications of Research Article

No.		Particulars	Minimum for 3 months
1		Journal based Recent Advance Learning- Presentation of select Article in Journal clubs	3
2	a	Patient Based laboratory or Skill based learning- Case presentation / Clinic	1 (1st year) 2 (2nd& 3rd year)
	b	Skill Lab / Simulation Lab Work	1
3	a	Self Directed Learning & Teaching- Presentation of Seminar	1
	b	Leading a Group Discussion on select Topic in GD	1
	c	Assignment Submission	1
4	a	Lecture / Tutorials / Panel Discussions with UG students	1
	b	Clinical Meetings (CME's) CPC/Dept. meeting	3
5		Medical Camps	1
6		Dissertation Work Research methodology workshop	Yes / No
7		Log Book & Attendance	Yes / No
8		Any other Activity Prescribed (T/P/Viva)	Yes / No

HOD HOI DEAN OF FACULTY REGISTRAR

Annexure V

Postgraduate Students Appraisal Form
Pre / Para /Clinical Disciplines – MD/MS Degree

Name of the Department/Unit : Roll No.:
Name of the PG Student :
Period of Training : FROM……TO……
Quarterly Assessment (1/2/3/4/5/6/7/8/9/10/11/12)

Sr. No.	PARTICULARS	Not Satisfactory			Satisfactory			More Than Satisfactory			Remarks
		1	2	3	4	5	6	7	8	9	
1.	Journal based / Recent advances learning										
2.	Patient based/Laboratory or Skill based learning										
3.	Self-directed learning and teaching										
4.	Departmental and interdepartmental learning activity										
5.	External and Outreach Activities / CMEs										
6.	Thesis / Research work										
7.	Log Book Maintenance										
8.	Performance in Theory/Practical/Viva voce Tests										
	Overall Assessment										

- **Publications of Research Article** **Yes/ No**
- **Presentation of Research Article**
- **The student has complied with mandatory requirement for quarterly assessment & presentation of Research Profile** **Yes/No**

Remarks*_____
_____
_____

***REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.**

SIGNATURE OF ASSESSEE **SIGNATURE OF HOD**

HEAD OF THE INSTITUTION

Annexure - VI

Mandatory Requirements to be eligible to eligible to appear for university Summative Examination / Evaluation – As per MCI Regulations.

(As per MCI Medical Education Regulation 2000, amended from time to time till date)

1. Minimum percent of Attence as per MCI Regulations.
2. Satisfactory performance in 12 CIA conducted and certified by HOD HOI and PG Guide.
3. Certificate from F.O. stating that all the fees due from the student are paid and credited to PIMS-DU A/.c
4. Presentation of a Research Article / Poster in a national / state level conference /Seminar / Workshop.
5. Publication of a Research Articles as first – author in (indexed in supus or web of science or as fixe by MCI Regulations and visited by UGC (ARE list).
6. a) Thesis – Finalisation of Topic and Title – submission of Synopsis following IEC clearance within 6 months of Adm. Topics
   b) After II year of a Admission or 3 terms Midterm Review .
   c) Thesis to be submitted at least 6 months before final examination.
   d)Thesis to be examined by 3 Examiners. (1 Internal and 2 External PG Examiners)
   e) Its Acceptance is a must for appearing for University T & P Exam

Note :- HOD & HOI shall ensure provisions of 1,2,3,4,5,6 a,b,c. The COE shall ensure provisions of 1,2,3,4,5,6 a,b,c ,d,e& e as per MCI Regulations

HEAD OF DEPARTMENT **HEAD OF INSTITUTION** **DEAN OF FACULTY** **REGISTRAR**

Annexure - VII

Ref. No. Date: _____

Complaince to MCI's Regulations Governing Post Graduate Programme in Medical Faculty

Department of _____ PGProgramme: MD/ MS in _____
Name of Candidate: _____, JR-III
PRN No. _____ Date of Admission _____

Certification on
Attendance and Training Completion
Publication & Presentation of Research Articles (Poster/ Oral)
Submission of Dissertation & Payment of All types of prescribed fees

It is hereby certified that the said candidate JR-III in the Dept. of _____ at Rural Medical College has completed 6 academic terms/ 3 academic years and fulfilled the prevailing provisions of the MCI Regulations governing MD/MS PG programmes and the rules of PMT, PIMS-DU. Details are as under.

1.	**Attendance Fulfillment ***	**% Attendance**	**Remark – Eligibility**
	I Academic Term		
	II Academic Term		
	III Academic Term		
	IV Academic Term		
	V Academic Term		
	VI Academic Term		
	Overall fulfillment		Fulfilled / Not Fulfilled
	* Fulfillment of a minimum of 80% of attendance/ academic term, for 6 terms/ 3 years including imparted training, assignment, fulltime responsibilities and participation in all facets of PG education process including periodic assessment and so on as per MCI Regulations.		
2.	Log Book maintained as per MCI Regulations & Fulfilled the graded responsibilities in the management and treatment of patients entrusted for their care Verified by Dr. _____ Certified by Dr. _____		Yes/ No
3.	Successful participation in teaching and training programmes organized by the department for UG and Interns		
4.	Presented and Participated in Seminars, Journal Clubs, Case Presentations, Group Discussions, Clinical Meetings, CME Ward Round, CPC, Practicals organized by the Department as per the timetable.		
5.	Participated in training sessions in diagnostics, medical/ surgical training, in basic/ applied medical and allied clinical specialties and Medical Camps as per the timetable		
6.	The Performance of the PG students in 12 CIAs (Conducted quarterly) are satisfactory as per appraisal proforma as per MCI Regulations.		

7.	Presented one research poster and one research article (oral) in a Seminar/ Symposia/ Workshop/ Conference (National/State). The certificates for presentation of paper/ poster are enclosed.	
8.	Published one research article in a scientific journal as per norms. The copy of the published research article is enclosed.	
9.	Submitted a Dissertation entitled _____ _____ _____ under the guidance of Dr. _____	
10.	Paid all the fees (tution fees and other fees) vide receipt No._____ for all 3 years.	
11.	Produced NOC from all the sections of PMT PIMS-DU concerned about "NO DUES"	
12.	Paid Examination fees of Rs. _____ vide Challan/ Receipt No. _____ dated _____ issued by Finance Officer PIMS-DU.	

It is hereby declared that the all the duly certified and verified documents, related to the aspects mentioned above, are in the custody of department concerned and student section of Rural Medical College with due authentication and signature of concerned HOD/ Dean/ Principal/ Dean of Faculty) and will be made available for any MCI inspection as per norms and Regulations.
Accordingly He/She is eligible/ not eligible for appearing in final year PG examination as per the MCI Regulations governing PG Programmes.

Seal

PG Guide
Dr. _____

Head of the Department
Dr. _____

Verified and certified that all types of prescribed fees and fines PMT, PIMS-DU, College, Hostel & Others mentioned at sl.no. 10, 11, 12 are paid by the student and credited to the accounts of PMT & PIMS-DU.

Seal

Finance Officer
PIMS-DU

Verified the relevant documents and certify that the candidate is eligible to appear for final year PG Examination as per MCI Regulations and rules of PIMS-DU.

Dean
Faculty of Medicine

Seal

Dean
Rural Medical College

Ref_____ **For Officer Use Only** Date: _____

The HOD, HOI and Dean have certified that the

a. Candidate is eligible to appear for PG Theory and Practical/ Clinical Examination as per MCI Regulations. F.O. has certified that all the fees has been credited to PMT, PIMS-DU Accounts.
b. The Dissertation submitted has been evaluated by external examiners and then have approved the same for acceptance as per MCI Regulations.
c. Hence the candidate be permitted to appear for the PG examinations (Theory & Practical/ Clinical) scheduled in the month of _____ year _____.

Controller of Examinations

Seal

Submitted for perusal and approval

Vice Chancellor

Annexure – VIII

PRAVARA INSTITUTE OF MEDICAL SCIENCES
(Deemed to be University)

Post Graduate Degree in Microbiology (MD)
Examination _____ 20__
Paper – I/ II/ II/ IV

Paper Title : _____ Date: / /20

Marks : 100 Time:

Instructions to candidate:

1) All questions are compulsory
2) Answer written in illegible handwriting will not be assessed.
3) Write answers on both sides of answer paper.
4) Neat diagrams must be drawn wherever necessary.
5) Write prescription where indicated, and in the use of drugs their doses should be given.

Que. 1		Marks 20
Que. 2		Marks 20
Que. 3		Marks 20
Que. 4	Write Short notes on	Marks 40 (10x4)
	a	
	b	
	c	
	d	

Annexure – IX

Table 1: Showing BLUEPRINTING for theory paper setting

The number of Questions & their distribution of marks shall be as per MCI model Question Paper [only Illustration]

LAQ/ SAQ and their Marks

LEVEL	Q	Q	Q	Q	Q	Q	Q	Total
	Mark	Mark	Mark	Mark	Mark	Mark	Mark	
Knowledge								
Comprehension								
Application								
Analysis								
synthesis								
Evaluation								
TOTAL								**1000**

The Questions (Whether LAQ or SAQ) Must aim at assessing all the 6 domains

Note: This is only an illustration. Actual Number of Questions and their distribution of marks shall be as per model Question Paper of MCI. (i.e. regarding the number of LAQ / SAQ and their marks distribution)

Table 2: Showing appropriate verbs suitable to level of knowledge for theory paper setting

Level	Suggested Verbs
Knowledge	Define, Describe, Draw, Find, Enumerate, Cite, Name, Identify, List, label, Match, Sequence, Write, State
Comprehension	Discuss, Conclude, Articulate, Associate, Estimate, Rearrange, Demonstrate understanding, Explain, Generalize, Identify, Illustrate, Interpret, Review, Summarize
Application	Apply, Choose, Compute, Modify, Solve, Prepare, Produce, Select, Show, Transfer, Use
Analysis	Analyze, Characterize, Classify, Compare, Contrast, Debate, Diagram, Differentiate, Distinguish, Relate, Categorize
Synthesis	Compose, Construct, Create, Verify, Determine, Design, Develop, Integrate, Organize, Plan, Produce, Propose, rewrite
Evaluation	Appraise, Assess, Conclude, Critic, Decide, Evaluate, judge, Justify, Predict, Prioritize, Prove, Rank

Table 3: Showing examples of theory questions

Sr. No.	Type	Explanation	Examples
1	**Long essay question**	✓ Question should pose clinical problem that will require student to apply knowledge along with integration with disciplines ✓ Avoid one liner as question ✓ Question stem should be structured ✓ Marking distribution should be provided ✓ Use of proper verbs from higher domains as given in this document ✓ Avoid recall based questions	
2	**Short notes**	✓ Sample a wider content ✓ Questions should be task oriented ✓ Reasoning questions provide opportunity for testing integration, clinical reasoning and analytical ability of the student	

Table 4: Showing Objective structured Practical examination [OSPE] typical station

Sr. No.	Type of station	Time allotted	Example	Evaluation
1	Procedure			
2	Response			

Annexure – X

University Examination
Model Marks Sheet
For Practical / Clinical Examination and Viva voce

Post graduate degree Practical examination Summer/ Winter:_____
Center:-_____ Date:- _____

Duration ___2 day Max Mark – 400

Illustration only

Seat No.	Long exercise Bacteriology (70)	Bacteriology short exercise (40)	Mycobacteriology/ Special staining (10)	Virology-exercise (20)	Immunology exercise (20)	Mycology exercise (30)	Parasitology exercise (30)	Serology exercise (20)	Identification of Slide (20)	Microteaching/ pedagogy (20)	Dissertation/ Thesis (20)	Oral/ Grand viva (100)	Practical total =400 Max=400 Min= 200

PG Examiners		Name	Signature
1	Chairman Name		
2	Internal Examiner		
3	External Examiner		
4	External Examiner		

Date:-
Place :-

Note:- 1) The Number of cases, type of cases and type of practical and orals / Viva voce and their distributions of marks shall be as per MCI Regulations / Syllabi.

2) The HOD / Chairman / Co Chairman BOS shall ensure at this proforma is prepared as per the MCI Regulations / Syllabi.

PRAVARA INSTITUTE OF MEDICAL SCIENCES (Deemed to be University) Loni - 413736 Tal - Rahata Dist. Ahmednagar (M.S. India)

Registrar
Pravara Institute of Medical Sciences
(Deemed to be University)
Loni-413736 Tal Rahata, Dist.Ahmednagar
(M.S.India)