



NUMS
NATIONAL UNIVERSITY
OF MEDICAL SCIENCES

Department of Pathology
Karachi Institute of Medical Sciences (KIMS)
Malir Cantonment, Karachi

PATHOLOGY GUIDEBOOK

THIRD PROFESSIONAL MBBS

NUMS BASED CURRICULUM

Table of contents

1.	Preface	03
2.	Mission, vision and objectives	04
3.	Introduction to General Pathology and Microbiology	05
4.	Format of internal evaluation	06
5.	Distribution of the subject in session	07
6.	Distribution of Pathology course (G. Pathology)	08
7.	Distribution of Microbiology course (Bacteriology)	13
8.	Distribution of Microbiology course (Virology)	15
9.	Distribution of Microbiology course (Parasitology & Mycology)	16
10.	List of small group teaching in the session	17
11.	List of practicals in the session	18
12.	Assessment method	20
13.	Table of specification	21

Preface

This Pathology study guide book for 3rd year MBBS undergraduates of KIMS provides a consolidated resource emphasizing important aspects of Pathology curriculum as per NUMS criteria. The study guide aims to promote self-regulated lifelong learning among students. Core curriculum aspects of undergraduate's competencies and assessment policies are delineated in this guide book. An overview of intended course outcomes and objectives in relation to the course content has been provided. Assessments methodology is in line with the institutional strategy. This study guide has been diligently designed, in accordance with the PMC and NUMS curriculum guide lines. Our dedicated faculty has put in tremendous effort to make this guide tailored to student's needs, all for better learning outcomes. In Pathology there are following disciplines:

1. Microbiology (Bacteriology; Virology; Parasitology; Mycology)
2. Immunology
3. Histopathology
4. Haematology
5. Clinical Pathology

Within this guidebook you are provided with complete "Academic Schedule", list of books and kit and information about internal evaluation.

VISION

The vision of Pathology department KIMS is to help produce modern day clinicians having in-depth knowledge about medical practices that are at par with local and global aspect of standard pathology practices and policies.

MISSION

The department of Pathology endeavors to provide quality education and to inculcate modern day integration of laboratory investigation to decrease morbidity and mortality in Pakistan.

OBJECTIVES

1. To provide better understanding and integration of basic and clinical subjects taught in medical curriculum of NUMS.
2. To provide guidelines of SOP for latest laboratory services
3. To provide better environment for research oriented teaching of Pathology
4. To encourage undergraduates to choose this field for post-graduation

INTRODUCTION TO GENERAL PATHOLOGY AND MICROBIOLOGY

Books and reading material

Recommended Text Books:

1. Basic pathology by Robins & Cotran
2. Pathologic basis of disease, Robbins
3. Board review series, pathology
4. Examination and board review, Medical Microbiology and Immunology, Appleton and Lange
5. Board review series, Microbiology and Immunology

Reference books:

1. Robbins and Cotran Atlas of Pathology
2. Curran's atlas of pathology
3. Illustrated pathology by Calendar
4. Manual of laboratory medicine AFIP

Pathology kit:

1. Journal of Microbiology & Immunology (One)
2. Journal of Histopathology & Hematology (One)
3. Histology pencils (1 pair)
4. Colored pencil box
5. Eraser (steadler or pelican)
6. Compass
7. Medical apron/lab coat (neat and ironed)
8. *Students will not be permitted to enter the laboratory without the complete kit.

FACULTY OF PATHOLOGY

Faculty at KIMS:

9. HOD Assistant Professor Dr. Tahera Kader. MBBS, MCPS. (Pathology)
10. Dr Umer Adnan MBBS Mphil Histopathology
11. Dr Maliha Saad MBBS FCPS Haematology
12. Lecturer Dr. Sadia Kashif. MBBS.
13. Lecturer Dr. Syeda Hira Abid. MBBS.
14. Lecturer Dr.Shomaila MBBS.
15. Lecturer Dr Daniya Tehseen MBBS
16. Lecturer Dr Sameen AmirMBBS

Faculty at CMH:

1. Associate Professor Lt.Col. Dr. Wajid Hussain. MBBS, FCPS. (Microbiology)
2. Assistant Professor Lt.Col. Dr. Mohsin MBBS, FCPS. (Chemical Pathology)
3. Assistant Professor Lt.Col. Dr.Naveed, FCPS. (Histopathology)
4. Assistant Professor Maj. Dr.Fatima Sana. MBBS, FCPS. (Microbiology)
5. Assistant Professor Maj. Dr.Ali FCPS Haematology

FORMAT OF INTERNAL EVALUATION

According to NUMS rules, 20% of marks in final examination will be given on internal evaluation in each subject. The candidate will be evaluated throughout their session. They are encouraged to appear regularly in their three modular examinations, to evaluate their progress. At the end of session, a pre-annual examination is conducted. It is mock and simulates the actual examination. It helps student to reevaluate their deficiencies. It includes Practical, Viva voce, Theory including SEQs and BCQs. The marks gained are added to the candidate internal evaluation. The system is as follows.

Following elements are included in internal evaluation.

INTERNAL ASSESSMENT - THEORY	
INTERNAL ASSESSMENT WEIGHTAGE: 20%	
Exams	Weightage
Attendance in Lectures: >90% = 10 80-89% = 07 75-79% = 05	10%
End of Block/ clinical rotation (Theory) Examination	45%
Continuous assessment: *Average score of all questions & answers attempted in (CBL) session during the academic year *Journal certification after each block	20%
Pre-Annual Exam	25%
INTERNAL ASSESSMENT STRUCTURE - PRACTICAL	
INTERNAL ASSESSMENT WEIGHTAGE : 20%	
Exams	Weightage
Attendance in Practicals: >90% = 10 80-89% = 7 75-79% = 5	10%
*End of Block/ clinical rotation (OSPE) Examination	45%
*Continuous assessment of Practical/ Laboratory skills and attitude *Journal certification after each block	20%
Pre-Annual Exam	25%
Total	100%

DISTRIBUTION OF SUBJECT IN THE SESSION

The course of Pathology is divided into three modules. Each block will end in a modular examination.

Details of allocated 300 hours

S. No.	Topic	Lectures	Tutorials	Practicals	Total hours
Module I [12/12/22- 19/02/23]					
1	Cellular adaptation & injury	14	5	7 x 2=14	33
2	General microbiology	12	5	7 x 2=14	31
Class test: 1					
3	Special bacteriology	14	6	8 x 2=16	36
Class test: 2					
Effective teaching		40 hours	15 hours	44 hours	100 hours
Modular exam: 20/02/2023-26/02/2023					
Module II [27/02/2023- 21/05/2023 2023]					
4	Inflammation	14	2	8 x 2=16	32
5	Repair & healing	04	1	1 x 2=02	07
6	Immunology	16	3	3 x 2=06	25
Class test: 3					
7	Fluid & hemodynamics	09	2	5 x 2=10	21
8	Virology	09	2	2 x 2=04	15
Class test: 4					
Effective teaching		52 hours	10 hours	38 hours	100 hours
Module II exam: 22/05/2023-28/05/2023					
Module III [29/05/2023- 27/08/23]					
8	Genetic disorders	07	1	1 x 2=02	10
9	Pediatric disease	03	1	3 x 2=06	18
10	Environmental disease	03	1		
11	Nutritional disorder	03	1		
12	Parasitology	12	4	8 x 2=16	32
Class test: 5					
13	Neoplasia	14	3	8 x 2=16	33
14	Mycology	04	1	1 x 2=02	07
Effective teaching		46 hours	12 hours	42 hours	100 hours
Preparation leave					
Pre-annual examination					
Preparation leave					
Professional examination					

DISTRIBUTION OF GENERAL PATHOLOGY IN THE SESSION

MODULE 1

A. ADAPTATION , CELL INJURY CELL INJURY & AGING

Lecture:

1. Introduction to pathology and etiological agents of cellular adaption and injury.
2. Cellular adaption and injury
3. Cellular Adaptations: Atrophy, hypertrophy, hyperplasia, metaplasia & dysplasia.
4. Different modes of cellular death including Necroptosis and Pyroptosis & free radical injury.
5. Pathogenesis of ischemic injury.
6. Apoptosis, difference between apoptosis and necrosis. Cellular aging.
7. Necrosis: Coagulative and Liquefactive.
8. Necrosis: Caseous, Fat and Fibrinoid Gangrene.
9. Cellular aging
10. Intracellular accumulations,
11. Pigmentation & calcification.

Practicals:

1. Gross and histology of hydropic swelling in kidney and fatty change in hepatocytes.
2. Gross and histology of different types of cellular adaptation.
3. Gross and histology of necrosis (Coagulative and liquefactive)
4. Gross and histology of necrosis (Caseous, fat and gangrene)
5. Gross and histology of calcification and pigmentation

CBLs:

1. Cellular adaptation
2. Apoptosis.
3. Necrosis.

MODULE 2

INFLAMMATION REPAIR & WOUND HEALING:

Lectures:

1. Cells of inflammation
2. Mediators of acute inflammation(Plasma derived mediators)
3. Cell derived mediators
4. Cytokines, chemokines and lysosomal enzymes
5. Pathogenesis of acute inflammation
 - Transudation
 - Activation of leukocytes
 - Chemotaxis
 - Formation of Phagolysosomes
 - Myeloperoxidase system and Lysosomal enzymes
6. Systemic effects of acute inflammation
7. Morphological types of inflammation
8. Cells, cytokines and interleukins of chronic inflammation.
9. Chronic Non-specific inflammation
10. Chronic specific inflammation
11. Control of normal cells proliferation and tissue growth cell cycle and its regulation
12. Extra cellular matrix and cell interaction. Soluble and insoluble factors
13. Healing by repair and scar formation and healing of fracture

FLUID AND HEMODYNAMICS:

1. Hyperemia, congestion, transudate, exudate & Edema
2. Thrombosis and infarction
3. Embolism
4. Hemorrhage and DIC
5. Shock

IMMUNOLOGY:

1. Definition antigen, antibody, epitope, hapten and adhesion molecules.
2. Differentiate between innate and acquired immunity.
3. The structure and function of Major Histocompatibility Complex (MHC).
4. The mechanism of humoral and cell mediated immunity.
5. Hypersensitivity Reactions: Type I, type II, type III and type IV with relevant examples.
6. Immunodeficiency disorders
7. Immunotolerance and immunoparalysis and graft versus host disease
8. Amyloidosis-Pathogenesis, classification.

Practicals:

1. Complete blood picture & its importance in different types of inflammation

2. Different types of inflammatory cells in histological section
3. Gross and histology of acute appendicitis
4. Gross and histology of an abscess.
5. To observe hemagglutination, fluorescence antibody and pregnancy test
6. Interpretation of Widal test/Typhi dot/ Pregnancy test
7. Gross and histology of parasitic infestation
8. Gross and histology of tuberculosis
9. Gross & histology of hyperemia/ congestion (Rt. & Lt. CCF)
10. Histology of a thrombus (Coronary) & different emboli
11. Gross and Histology of red and white infarct (including MI)
12. Gross and histology of chronic cholecystitis
13. Amyloidosis
14. Graft versus host disease

CBLs:

1. Acute and chronic gout
2. Blood grouping and cross matching
3. Hypersensitivity reactions type I, II and III
4. Immunodeficiency syndrome AIDS
5. Type IV hypersensitivity reaction
6. Keloid and wound healing
7. Embolism and its complications
8. To study evaluation of INR

MODULE 3

GENETICS; ENVIRONMENTAL DISEASE, NUTRITIONAL DISORDER, PAEDIATRIC DISEASES

Lecture:

1. Definitions of gene, genome & mutations [point mutation, deletion, insertion & trinucleotide repeat mutations].
2. Biochemical & molecular basis of single gene disorders
3. Mitochondrial mutations. Prader- Willi syndrome and Angelman syndrome: Multifactorial & Polygenic inheritance. Enlist common diseases with multifactorial causes.
4. Karyotyping and indication for pre-natal and post- natal studies
5. Gonadal mosaicism diagnosis of genetic disorders Principal & use of PCR in molecular diagnosis
6. Disorders associated with receptor proteins
7. Cytogenetic disorders involving sex chromosomes. Klinefelter syndrome; Edward's syndrome; Turner's syndrome. Hermaphroditism
8. Chromosomal disorders; Structural abnormalities; Cytogenetic disorders involving autosomes and Trisomy 21, Down syndrome and Edwards syndrome
9. Disorders associated with defects in enzymes LSD and GSD
10. Hypercholesterolemia

NEOPLASIA

1. Nomenclature of neoplastic proliferations.
2. Biological behavior of benign & malignant tumors.
3. Cancer incidence and its relationship with geographic and environmental factors. Chronic infections and pre-cancerous conditions.
4. DCAG 1: Introduction
5. DCAG 2: Addition and gain of function oncogene
6. DCAG 3: Deletions and TSGs
7. DCAG 4: Epigenetic changes
8. Multistep carcinogenesis Spread of tumor Invasion and metastasis
9. Grading and staging of malignant tumors
10. Paraneoplastic syndrome
11. Systemic effects of neoplasms & Lab diagnosis.

Practical:

1. Gross morphology of benign & malignant tumors
2. Histology of dysplasia and carcinoma in situ
3. Histology of different benign tumors (Lipoma; Leiomyoma)
4. Histology of different benign tumors (Papilloma; fibroadenoma)
5. Histology of different epithelial malignant tumors. (Breast, colon and ovary)
6. Histology of different mesenchymal tumors (fat, smooth muscle cell, heart, bone, WBC)
7. Gross and histology of germ cell tumors.
8. Gross and histology of mixed tumors. (Teratoma)

CBLs:

1. Nutritional and pediatric disorders (Diabetes mellitus and cystic fibrosis)
2. Environmental disease: Pneumoconiosis
3. Chronic infections and precancerous conditions
4. Different genetic defect. Down syndrome and sickle cell disease
5. Neoplasia I : Breast carcinoma
6. Neoplasia II: Lymphadenopathy (Hodgkin's lymphoma)

DISTRIBUTION OF MICROBIOLOGY IN THE SESSION

MODULE 1: BACTERIOLOGY

Lectures:

A. General bacteriology:

1. Introduction to microbiology. Bacterial taxonomy and classification.
2. Difference between Prokaryotes & Eukaryotes
3. Structure of bacterial cell wall [bacterial chromosome, cytoplasm, cytoplasmic membrane]
4. Structure of bacterial cell wall [Difference between gram positive & negative bacteria]
5. Structure of bacterial cell wall [capsule, Flagella, pili and fimbriae]
6. Metabolism and bacterial growth. Function of bacterial cell membrane
7. The growth, survival & death of micro-organisms. Bacterial growth curve.
8. Endospore and bacterial metabolism
9. Mode of pathogenesis of different bacteria: Adhesiveness, invasion of host. motility & production of toxins] [Difference between exotoxin and endotoxin]
10. Introduction & general features of bacterial genetics. [chromosome and plasmids]
11. Transformation, transduction and bacterial conjugation. Transfer of anti-biotic resistance.
12. Effective drug concentration. Antibacterial drugs and their mechanism of action.

B. Special bacteriology:

1. Classification, epidemiology, identification, pathogenesis & diseases caused by:
2. Staphylococci: *S. aureus*; *S. epidermidis* & *S. saprophyticus*
3. Streptococci: β - hemolytic streptococcus group A & B, *Streptococcus pneumoniae* & *S. agalactiae*
4. Diphtheria sp. *Bordetella* sp. *Actinomyces Israeli* and *Nocardia asteroides*
5. *Bacillus anthracis*, *Clostridium perfringens*, *C. botulinum*, *C. difficile* and *C. tetani*
6. Gram-negative bacilli and Enterobacteriaceae. Lactose fermenters *E. coli*, *Klebsiella* & *Enterobacter*. Non-lactose fermenters: *Pseudomonas*, *Proteus*, *Salmonella*, *Shigella*, *Yersinia pestis*.
7. *Vibrio cholera*, *Vibrio parahaemolyticus*, *Campylobacter jejuni*, *Helicobacter pylori*.
8. *Treponema palladium*, *Borrelia burgdorferi* and *Leptospira*.
9. Gram negative cocci: *Neisseria meningitidis* and *Neisseria gonorrhoeae*
10. *Haemophilus influenzae*, *Bordetella*, *Brucella* and *Francisella*. *Legionella pneumophila*, *Gardnerella vaginalis*.
11. *Mycobacterium tuberculosis* and *Mycobacterium bovis*.
12. *Mycobacterium leprae*. Classification of leprosy.
13. Chlamydiae & Rickettsiae. *Mycoplasma pneumoniae*.

Practicals:

1. Orientation to lab safety. Perform six steps of hand hygiene. Part of microscope. Collection of different specimens for lab. Observe steps in management of spill of fluid in the lab.
2. Donning and doffing of PPE and Grams staining
3. To study motility test, catalase test and oxidase test.
4. To study simple, enriched & differential culture media. Culture & sensitivity and its interpretation.
5. To study growth of different organisms on nutrient agar.
6. To study spore forming bacteria, Clostridia species and significance of anaerobic jar.
7. To study growth of different organism on blood and chocolate agar.
8. To study growth of different on MacConkey agar. (LF/NLF), TSI agar. (LF/NLF),
9. To study utilization of Simon citrate utilization, Indole and urease
10. Photomicrographs of different organism
11. To study growth of acid-fast bacilli on L.J. medium and perform Z.N staining for isolation mycobacteria.

CBLs:

1. Sterilization. Skin & wound infection
2. Sore throat
3. Pneumonia
4. UTI
5. Diarrhea
6. Acute watery diarrhea
7. Typhoid
8. Tuberculosis

MODULE 2: VIROLOGY

Lectures:

1. Classification and general features of DNA & RNA viruses
2. Describe zoonotic viral diseases: Rabies, Prion disease etc.
3. Genital infection: Herpes, Papilloma virus, HIV
4. GIT infection: Rota, Astro, Hepatitis A, B, C, D, E, G, CMV, EBV
5. Hepatitis A, B, C, D, E, G classification, pathogenesis, MOT & lab diagnosis.
6. The Respiratory Tract Infection: Measles, Herpes, Adeno, Influenza, Parainfluenza, Rhino, RSV, Influenza virus
7. Skin infection: Small pox, Moluscum contagiosum, Herpes, Measles, Rubella, Chicken pox. HPV
8. Classify oncogenic viruses, their mode of transmission, pathogenesis, lab diagnosis and prevention.
9. CNS Infections: Entero, Mumps, Herpes, Adeno, Arbo: Brief pathogenesis.

Practicals:

1. Hepatitis
2. Photomicrographs of important viral diseases. (Meningitis, hepatitis)

CBLs:

1. Fever with rash
2. Viral hemorrhagic fever (Dengue & CC)

MODULE 3: PARASITOLOGY & MYCOLOGY

Parasitology:

Lectures:

1. Classification of parasites.
2. Intestinal and tissue protozoa: *Giardia lamblia*, *Entamoeba histolytica*, *Balantidium Coli*.
Trichomonas vaginalis
3. *Leishmania* species, *Toxoplasma gondii*, *Pneumocystis carinii*,
4. *Plasmodium* species, Malaria
5. *Trypanosoma*
6. Trematodes: *Schistosoma* (*hematobium*, *mansoni*, *japonicum*),
7. Trematodes: *Fasciola hepatica*, *Fasciolopsis buski*, *Clonorchis sinensis*
8. Cestodes: *Taenia* (*solium*, *saginata*), *Echinococcus* species, *H. nana*.
9. Cestode: *Diphyllobothrium latum*.
10. Intestinal Nematodes: *A. lumbricoides*, *A. duodenale*, *E. vermicularis*, *T. trichiuria*, *S. stercoralis*
11. Tissue & blood Nematodes: *T. spiralis*, *Onchocerca volvulus*, *Toxocara* species. *Microfilariae* species.

Mycology:

Lectures:

1. Classification of major mycosis and their causative fungi
2. General properties and classification of fungi
3. Dermatophyte infections
4. Systemic fungal infections

Practicals:

1. To perform stool D/R. *Entamoeba histolytica* & *Giardia lamblia*
2. Lab diagnosis & life cycle. MP, thick and thin film. ICT malaria
3. Photomicrographs of different of Nematodes
4. To perform urine D/R.
5. To observe photomicrographs of fungi

CBLs:

1. Photomicrographs of different Protozoa and their clinical significance
2. *Leishmania*. LD bodies in peripheral smear.
3. Photomicrographs of different cestodes and trematodes
4. Scabies
5. Mycology: Candidiasis and its complications

SMALL GROUP TEACHING

Module I	
1	Cellular adaptations (Tutorial)
2	Calcification (CBL)
3	Apoptosis (CBL)
4	Necrosis (Tutorial)
5	Sterilization (CBL)
6	Skin & wound infection (CBL)
7	Sore throat (CBL)
8	Pneumonia (CBL)
9	Diarrhea (CBL)
10	Acute watery diarrhea (CBL)
11	UTI (CBL)
12	Typhoid
13	Tuberculosis (CBL)
Module II	
1	Acute inflammation (A. appendicitis) (CBL)
2	Acute & chronic gout with significance of ESR & CRP (CBL)
3	Chronic inflammation (C. cholecystitis; T.B.) (CBL)
4	Wound healing (CBL)
5	Type I hypersensitivity (CBL)
6	Type IV hypersensitivity (CBL)
7	Immunodeficiency syndrome-AIDS. (CBL)
8	Edema (CBL) (Difference between Lt. & Rt. Sided failure)
9	Thrombosis/embolism (CBL). Complications of other embolisms.
10	Infarction (CBL). Laboratory diagnosis & ECG in MI.
11	Shock (CBL). DIC & its management. Evaluation of INR
12	Fever with rash (CBL)
13	Viral hemorrhagic fever (CBL)
14	Hepatitis (CBL)
Module II	
1	Genetic disorder I (Down's syndrome) (CBL)
2	Genetic disorder II (Sickle cell disease) (CBL)
3	Environmental disease I (Pneumoconiosis) (CBL)
4	Environmental disease I (Squamous cell carcinoma) (CBL)
5	Parasitology I: Chronic Amebiasis (CBL)
6	Parasitology II: Malaria (ICT) (CBL)
7	Parasitology III: Cestodes and Trematodes (CBL)
8	Parasitology IV: Scabies
9	Benign tumor: Fibroadenoma & Leiomyoma (CBL)
10	Malignant tumor I: Carcinoma of breast (CBL)
11	Malignant tumor II: Hodgkin's lymphoma (CBL)
12	Mycology: Candidiasis and its complications (CBL)

LIST OF PRACTICALS

General Microbiology	
1	Orientation to laboratory, biosafety & biohazards. Different parts of a light microscope
2	To study collection of different specimens for microbiological laboratory.
3	To study simple, enriched & differential culture media. Culture & sensitivity and its interpretation.
4	To perform Gram's staining. Observe the microorganisms.
5	To perform motility test, oxidase test and catalase test.
Special bacteriology	
6	To study growth of different organisms on nutrient agar
7	To study different species of staphylococci on blood culture medium
8	To study different species of streptococci on blood culture medium.
9	To study spore forming bacteria, Clostridia species and significance of anaerobic jar.
10	To study growth of different organism on MacConkey agar. (LF/NLF)
11	To study growth of different organism on TSI agar. (LF/NLF)
12	To differentiate between lactose fermenters, E. coli and Klebsiella. Indole and urease
13	To differentiate between non- lactose fermenter. Urease test & citrate test.
14	To study growth of acid-fast bacilli on L.J. medium & perform Z.N staining for isolation mycobacteria.
15	Photomicrographs of different organism
Cellular adaptation & injury	
1	Hypertrophy & hyperplasia
2	Atrophy & aplasia
3	Dysplasia & metaplasia
4	Hydropic change & fatty change
5	Coagulative, fibrinoid & liquefactive necrosis
6	Enzymatic, caseous, gangrenous necrosis
7	Calcification & pigmentation
Inflammation	
1	Complete blood picture & its importance in different types of inflammation
2	Different types of inflammatory cells in histological section
3	Gross & histology of acute appendicitis
4	Gross & histology of abscess
5	Gross & histology of chronic cholecystitis
6	Gross & histology of tuberculosis
7	Gross & histology of parasitic infestation
Healing and repair	
8	Keloid & wound healing
Fluid & hemodynamics	
9	Gross & histology of Hyperemia, congestion & edema
10	Thrombosis. Histology of a thrombus (Coronary)
11	Embolism: Photomicrographs of different emboli
12	Gross and Histology of red and white infarct (including MI)
13	Hemorrhage
14	Amyloidosis
Immunology	
15	Typhi dot and Widal test
16	To observe Hemagglutination, Fluorescent technique, RIA, ELISA and pregnancy test
17	Blood grouping and cross matching
Virology	
18	Hepatitis
19	Photomicrographs of important viral diseases. (meningitis, hepatitis)
Neoplasia	

1	Gross characteristic features of different benign tumors
2	Gross characteristic features of different malignant tumors
3	Histology of dysplasia and carcinoma in situ
4	Histology of different benign tumors: Lipoma, leiomyoma, Papilloma.
5	Histology of different epithelial malignant tumors. Ca breast, Colorectal ca, Adenoca. Ovary.
6	Histology of different mesenchymal malignant tumors. Leiomyosarcoma, Rhabdomyosarcoma, Osteosarcoma, Leukemia.
7	Gross and histology of mixed tumors. Germ cell tumors and Teratoma.
8	Revision of glass slides
Genetics, Pediatric disease, Environmental, Nutritional diseases	
9	To observe photomicrographs of different genetic defect
10	Pediatric disease, Environmental, Nutrition disorder.
Parasitology & Mycology	
11	To perform stool D/R. Entamoeba histolytica & Giardia lamblia
12	To perform urine D/R.
13	Lab diagnosis & life cycle. MP, thick and thin film. ICT malaria
14	To detect LD bodies in peripheral smear.
15	Lab diagnosis & life cycle of Cestodes
16	Lab diagnosis & life cycle of Trematodes
17	Lab diagnosis & life cycle of Nematodes
18	Lab diagnosis & life cycle of microfilaria
19	To observe photomicrographs of fungi
20	Revision of glass slides

