

COURSE, CURRICULUM AND GUIDELINES FOR THE TRAINING PROGRAMME OF M.D. PATHOLOGY, DELHI UNIVERSITY

BROAD GOALS

The goals of MD Pathology course is to produce a specialist who is competent to provide laboratory based diagnosis of illness, is able to teach undergraduates and to a certain extent postgraduates. He/she should have an idea regarding the planning of research and should be well conversant with emerging technology.

1. PROGRAMME OBJECTIVES

- 1.1. Capable of offering a high quality diagnostic opinion in a given clinical situation with an appropriate and relevant sample of tissue, blood, body fluid, etc. for the purpose of diagnosis and overall well being of the ill.
- 1.2. Able to make independent decisions in routine diagnostic histopathology, hematology, cytology, clinical pathology and immunology.
- 1.3. Able to teach and share his knowledge and competence with others. Should be conversant in modern methods of medical education and teaching.
- 1.4. Should be familiar with current developments and advances in the field of pathology.
- 1.5. Capable of pursuing clinical and laboratory based research.

2. SPECIFIC LEARNING OBJECTIVES

2.1. Cognitive Domain

- 2.1.1. Diagnose routine and complex clinical problems on the basis of Histopathology (Surgical Pathology) and Cytopathology specimens. Blood and Bone Marrow examination (Hematology) and various tests under the domain of Laboratory Medicine (Clinical Pathology, clinical Biochemistry/Chemical Pathology) as well as Blood Banking (Transfusion medicine).
- 2.1.2. Interpret clinical and laboratory data with reasonable accuracy.
- 2.1.3. Able to correlate clinical and pathology data so that various clinical signs, symptoms and manifestations of disease can be correlated and explained.

- 2.1.4. Advice on the nature of appropriate specimens and the tests necessary to arrive at diagnosis in a difficult or problematic case.
- 2.1.5. Able to correlate clinical and laboratory findings with pathology findings at autopsy, identify discrepancies and the causes of death due to diseases (apart from purely metabolic causes).
- 2.1.6. Able to teach Pathology to undergraduates, postgraduates, nurses and paramedical staff including laboratory personnel.
- 2.1.7. Carry out research using basic research methodology so that they can conduct fundamental and applied research.
- 2.1.8. Maintain accurate records of tests and their results for reasonable periods of time so that these may be retrieved as and when necessary.
- 2.1.9. Make and record observations systematically that is of use of archival purposes and for furthering the knowledge of Pathology.
- 2.1.10. Able to systematically write a paper and publish in a journal.
- 2.1.11. Able to present a paper in a conference through an oral presentation and poster presentation.
- 2.1.12. Should be able to identify problems in the laboratory and offer solutions thereof so that a high order of quality control is maintained.
- 2.1.13. Should be capable of effectively disposing laboratory waste to ensure minimization of risk to infection and accidents to laboratory personnel.
- 2.1.14. Able to supervise and work with subordinates and colleagues in a laboratory.
- 2.1.15. Subject himself/herself to continuing education and constantly update his/her knowledge of recent advances in Pathology and allied subjects.

2.2 Psychomotor Domain

- 2.2.1 Able to perform most of the routine tests in a Pathology Laboratory including grossing of specimens, processing, cutting of paraffin sections and staining. Should be familiar with making frozen sections and staining.
- 2.2.2 Able to collect specimens by routinely performed non-invasive out-patient procedures such as venepuncture, finger-prick, fine needle aspiration cytology of palpable lumps and bone-marrow aspirates, staining of blood and bone marrow smears.

- 2.2.3 Should provide appropriate help to colleagues performing an invasive procedure such as a biopsy or an imaging guided biopsy. It is implied that the complications of these procedures and handling of complications are apparent.
- 2.2.4 Perform an autopsy, dissect various organ complexes and display of gross findings.
- 2.2.5 Should be familiar with the function, handling and routine care of equipment in the laboratory.

2.3 Affective Domain

- 2.3.1 Should be able to function as a part of a team that is essential for the diagnosis and management of a patient. Should therefore develop an attitude of cooperation with colleagues necessary for this purpose. It is implied that whenever necessary interact with the patient and the clinician or other colleagues provided for best possible diagnosis or opinion.
- 2.3.2 Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel.
- 2.3.3 Respect the rights of the patient including the right to information and second opinion.
- 2.3.4 Should seek and give second opinion only where necessary.
- 2.3.5 Provide leadership and inspire members of the team involved with in the fields of diagnostic pathology, teaching and research.
- 2.3.6 Develop communication skills not only to word reports and professional opinions but also to interact with patients, relatives, peers and paramedical staff.

3. Post Graduate Training

3.1. Duration of Course

- 3.1.1 The course of Doctor of Medicine (Pathology) or M.D. (Pathology) will be of Three Years duration in the form of Residency programme that is Full Time.

3.2 Training Programme

While professional training in all branches is equally important, since they are inter-dependent and competitive, a balance of emphasis is desirable. Based on the available facilities each department can prepare a list of postgraduate experiments pertaining to basic and applied Pathology. Active learning should form the mainstay of

postgraduate training there should be lectures for postgraduates (at least 20 per year) alongwith seminars, symposia, group-discussions, Journal clubs in which the post graduates should actively participate and present. The Post graduate students should regularly attend clinico-pathological conferences and learn cases of interest for discussion. Each college should have a medical education unit to generate teaching resource material for UG and PG teaching and prepare problem solving modules.

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. 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 & skill, extramural postings may be undertaken.

SECTION	DURATION IN MONTHS
Surgical Pathology including Special staining, surgical techniques and immunopathology.	12 months
Haematology including transfusion medicine	10 months
Cytopathology	8 months
Autopsy including museum techniques and record management	2 months
Clinical pathology / laboratory medicine to include (routine urine examination, semen examination and clinical biochemistry)	2 months
Rotation in research laboratories including electron microscopy, molecular biology and cytogenetics	2 months
TOTAL	36 MONTHS

3.3 Scope of Training

The training programme is designed to enable the student to acquire a capacity to learn and investigate for himself, to synthesize and integrate a set of facts and develop a faculty to reason. The curricular programmes 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 is recommended under a residency programme on learning while serving/working. The following is a rough guideline to various teaching / learning activities that may be employed.

- (i) Collection of specimens including Fine needle aspiration of superficial/palpable lumps.
- (ii) Grossing of specimens.
- (iii) Performing autopsies.
- (iv) Discussions during routine activities such as during signing out of cases.
- (v) Presentation and work-up of cases including the identification of special stains and ancillary procedures needed.
- (vi) Clinico-pathological conferences.
- (vii) Intradepartmental and interdepartmental conferences related to case discussions.
- (viii) Conferences, Seminars, Continuing Medical Education (CME) Programmes.
- (ix) Journal Club.
- (x) Research Presentation and review of research work.
- (xi) Guest and in-house lectures.
- (xii) Participation in workshops, conferences and presentation of papers etc.
- (xiii) Laboratory-work.
- (xiv) Use and maintenance of equipment.
- (xv) Maintenance of records.
- (xvi) Teaching undergraduates and paramedical staff.

3.4 General Acquaintance

Following are the field in which the student is expected to acquire a general acquaintance of techniques and principles and competence to understand and interpret data without being called upon to achieve technologic proficiency.

- (i) Immunopathology
- (ii) Electron microscopy
- (iii) Histochemistry
- (iv) Immunohistochemistry

- (v) Use of radioisotopes
- (vi) Cytogenetics
- (vii) Tissue Culture
- (viii) Medical Statistics
- (ix) Molecular Biology including recent advances.
- (x) Maintenance of records
- (xi) Information retrieval, Computer, Internet in Medicine.
- (xii) Quality control
- (xiii) Waste disposal

4. Course Content

The Study of Surgical Pathology includes all aspects of pathology as encompassed in the branches of General and systemic Pathology. Only the broad outlines are provided.

4.1 General Pathology

Normal cell and tissue structure and function. The changes in cellular structure and function in disease. Causes of disease, its pathogenesis, reaction of cells, tissues, organ systems and the body as a whole to various sublethal and lethal injuries.

4.2 Surgical Pathology

4.2.1 Knowledge

- The student should be able to demonstrate understanding of the histogenetic and patho-physiologic processes associated with various lesions during discussions with colleagues, clinicians, students and patients.
- Should be able to identify problems in the laboratory and offer viable solutions.

4.2.2 Skills

- Given the clinical and operative data, the student should be able to identify, and systematically and accurately describe the chief gross anatomic alterations in the surgically removed specimens and be able to correctly diagnose at least 80 percent of the lesions received on an average day from the surgical service of an average teaching hospital.
- A student will be able to demonstrate ability to perform a systematic gross examination of the tissues including the taking of appropriate tissue section and in

special cases as in intestinal mucosal biopsies, muscle biopsies, and nerve biopsies, demonstrate the orientation of tissues in paraffin blocks.

- Given the relevant clinical, operative and radiological data, the student should be able to identify and systematically and accurately describe the morphological findings. Should also correctly interpret and as far as possible, correlate with the clinical data to diagnose at least 90% of the routine surgical material received on an average day. Should be able to diagnose at least 75% of the classical lesions being commonly encountered in the surgical pathology service without the aid of the clinical data.
- Start the automatic tissue-processing machine and verbally demonstrate his understanding of the principles of its running.
- Process a tissue, make a paraffin block and cut sections of good quality on a rotary microtome.
- Stain paraffin sections with at least the following;
 - Haematoxylin and eosin
 - Stains for collagen, elastic fibers and reticulin
 - Iron stain
 - PAS stain
 - AFB
 - Amyloid
 - Fat
 - Calcium
- Demonstrate understanding of the principles of:
 - Fixation of tissues
 - Processing of tissues for section cutting
 - Section cutting and maintenance of related equipment
 - Differential (Special) stains and their utility.
- Cut a frozen section of tissues received from the operating room for quick diagnosis, stain and interpret the slide in correlation with the clinical data provided.
- Demonstrate the understanding of the utility of various immunohistochemical stains especially in the diagnosis of tumour subtypes.

4.3 Autopsy Pathology

4.3.1 Knowledge

- Should be aware of the technique of autopsy.
- Should have sufficient understanding of various disease processes so that a meaningful clinico-pathological correlation can be made.

4.3.2 Skills

- Demonstrate ability to perform a complete autopsy independently with some physical assistance, correctly following the prescribed instructions. Correctly identify all major lesions which have caused, or contributed to, the patient's death on macroscopic examination alone.
- Identify and correctly diagnose at least 90% of the microscopic lesions found in most autopsies, and be able to correlate the pathologic changes with the patient's clinical history and events of a few days preceding death.
- Write correctly and systematically provisional and Final Anatomic Diagnosis reports (on gross and microscopy respectively), the major findings at autopsy, and the Autopsy Protocol as per prescribed instructions, of a standard fit for an international journal.

4.4 Cytopathology

4.4.1 Knowledge

- Should possess the background necessary for the evaluation and reporting of Cytopathology specimens.
- Demonstrate familiarity with methods of specimen collection, cytopreparation and turn around time for common specimens.
- Knowledge of current Bethesda system for Gynae cytopathology.
- Knowledge of elements of adequacy, current lab reporting systems, FNAC, exfoliative non Gynae cytopathology specimens.
- Ancillary techniques including image analysis, immuno cytochemistry flow cytometry FISH etc.
- Principles of automated screening for Gynae cytopathology specimens.
- Quality control and improvement along with risk management.
- Knowledge of LBC, Thin preparation and other advancement in cytology.

- Demonstrate verbal familiarity with, and guide the clinical residents in the following, keeping in view of the special requirements of each case (cyto-hormonal status, malignancy, infection, etc.).
 - Choice of site from which smears may be taken (as in the case of vaginal smears).
 - Type of smear (morning specimen, after specimen, pre-menstrual specimen, etc.)
 - Method of obtaining various specimens (urine sample, gastric smear, colonic lavage etc.)

4.4.2 Skills

- Should have competency in history taking, preparation of patients, interpretation of adequacy of aspirates and appropriate after care of patients.
- Independently stain good quality smears for cytopathologic examination and be conversant with the principles and preparation of solutions of stains (MCG, PAP, AFB).
- Demonstrate conversance with the techniques for concentration of specimens: i.e. various filters or cytocentrifuge.
- Working familiarity with instruments and materials related for FNAC, preparation of smears, proper handling for ancillary techniques.
- Independently be able to perform fine needle aspiration of palpable/superficial lumps in patients; make good quality smears, and be able to decide on the type of staining in a given case.
- Given the relevant clinical data. Should be able to independently and correctly:
 - (i) Evaluate hormonal status in all cases as may be required.
 - (ii) Diagnose normal reactive infectious dysplastic and neoplastic conditions and diagnose the status of malignancy or otherwise in at least 75% of the cases received in a routine laboratory and categorize them into negative, inconclusive or positive.
 - (iii) Demonstrate ability in the technique of screening and dotting of slides for suspicious cells.
 - (iv) Identify with reasonable accuracy the presence of organisms, fungi or parasites.

4.5 Haematology

4.5.1 Knowledge

- Should demonstrate the capability of utilizing the principles of the practice of Haematology for the planning of tests, interpretation and diagnosis of disease of the blood and bone marrow.
- Should be conversant with various equipments used in the Haematology laboratory.
- Should have knowledge of automation and quality assurance in Haematology.

4.5.2 Skills

- Correctly plan a strategy of investigating cases referred for special investigations in the Hematology clinic and give ample justification for each step in consideration of the relevant clinical data provided.
- Describe accurately the morphologic findings in the peripheral and bone marrow smears, identifying and quantitating the morphologic abnormalities in disease states and arriving at a correct diagnosis in at least 90% of the cases referred to the Haematology clinic, given the relevant clinical data.
- Correctly and independently perform the following special tests, in addition to doing the routine blood counts:
 - (i) Haemogram including Reticulocyte and Platelet counts.
 - (ii) Perform a successful bone marrow aspiration/iliac crest biopsy and stain the peripheral and bone marrow smears with Romanowsky stains.
 - (iii) Bone marrow staining including stain for iron.
 - (iv) Cytochemical characterization of leukemia with special stains like Peroxidase, Leukocyte Alkaline Phosphatase (LAP), PAS, Sudan Black, Oil Red O, Acid Phosphatase (including Taratarate resistant) and non specific esterase.
 - (v) Osmotic fragility
 - (vi) Fetal Haemoglobin
 - (vii) Sickling phenomenon
 - (viii) Bleeding time
 - (ix) Clotting time
 - (x) Prothrombin time (PT)

- (xi) Activated partial thromboplastin time (APTT)
 - (xii) Haemoglobin electrophoresis, paper electrophoresis
 - (xiii) Coombs Test
 - (xiv) Clot solubility Test
 - (xv) HAM's sucrose lysis Test
- Demonstrate familiarity with the principle and utility in diagnosis of the following:
 - (i) Red cell indices
 - (ii) Plasma haemoglobin
 - (iii) Haemosiderin in urine
 - (iv) Presumptive tests for complete antibodies
 - (v) Serum electrophoresis
 - (vi) Platelet function tests including platelet aggregation and adhesion and PF3 release
 - (vii) Russell's viper venom time (RVVT)
 - (viii) Coagulation Factor assays
 - (ix) Screening for coagulation factor inhibitors
 - (x) Fibrin Degradation products (FDP), D-dimers
 - (xi) Monitoring of anticoagulant therapy
 - (xii) Tests for thrombosis: Lupus anticoagulant (LAC), Anticardiolipin antibody (ACA), Activated protein C Resistance (APCR), Protein C (Pr C), Protein S (Pr S), Antithrombin III (AT III).
 - (xiii) Serum ferritin
 - (xiv) Serum iron and total iron binding capacity
 - (xv) Immunophenotyping
 - (xvi) Cytogenetics
- Demonstrate verbally and in writing, his/her understanding of the principles of the above tests their utility in diagnosis and interpretation of results.
 - Posses working knowledge of the following:
 - (i) Bone marrow transplantation
 - (ii) Prenatal diagnosis of genetic haematological diseases

4.6 Laboratory Medicine

4.6.1 Knowledge

- Demonstrate familiarity with the normal range of values of the chemical content of body fluids, significance of the altered values and interpretation thereof.
- Possess knowledge of the principles of following specialized organ function tests and the relative utility and limitations of each and significance of altered values.
 - (i) Renal function test
 - (ii) Liver function test
 - (iii) Gastric and Pancreatic function
 - (iv) Endocrine function test
 - (v) Tests for malabsorption
- Explain the biochemical principles involved in the above estimations.
- Know the principles, advantages and disadvantages scope and limitation of Automation in laboratory.
- Learn the principles and methodology of quality control in laboratory.

4.6.2 Skills

- Plan a strategy of laboratory investigation of a given case, given the relevant clinical history and physical findings in a logical sequence, with a rational explanation of each step. He should be able to correctly interpret the laboratory data of such studies, and discuss their significance with a view to arrive at a diagnosis.
- Demonstrate familiarity with and successfully perform a routine urinalysis including Physical, Chemical and Microscopic, examination of the sediment.
- Independently and successfully perform a complete examination; physical, chemical and cell content of Cerebrospinal fluid (C.S.F.), pleural and peritoneal fluid.
- Successfully perform an examination of Peripheral Blood for the commonly occurring parasites.
- Independently perform a Semen analysis.
- Demonstrate: Independently and correctly perform at least the following Quantitative Estimations by manual Techniques and/or Automated Techniques.

- (i) Blood urea
- (ii) Blood sugar
- (iii) Serum proteins total & fractional
- (iv) Serum bilirubin total & fractional
- (v) Serum Cholesterol
- (vi) Serum Creatinine
- Demonstrate familiarity with the following quantitative estimations by Automated Techniques
 - (i) Serum Cholesterol
 - (ii) Uric acid
 - (iii) Serum Transaminases (ALT and AST/SGOT and SGPT)
 - (iv) Serum Alkaline phosphatase
 - (v) Creatinine
 - (vi) Serum calcium and phosphorous
 - (vii) Serum electrolyte (Na⁺ and K⁺)
 - (viii) Determination of bicarbonates
 - (ix) Blood gas analysis.
- Prepare standard solutions and reagents relevant to the above tests, including the preparation of normal solution, molar solution and buffers.
- Explain the principle of instrumentation, use and application of the following instruments.
 - (i) Photoelectric colorimeter
 - (ii) Spectrophotometer
 - (iii) pH meter
 - (iv) Flame photometer
 - (v) Centrifuge
 - (vi) Analytical balance
 - (vii) Electrophoresis apparatus
 - (viii) Light microscope
 - (ix) Blood gas analyser

4.7 Transfusion Medicine (blood banking)

4.7.1 Knowledge

It is expected that students should possess knowledge of the following aspects of transfusion medicine.

- (i) Basic immunology
- (ii) ABO and Rh groups
- (iii) Clinical significance of other blood groups
- (iv) Transfusion therapy including the use of whole blood and RBC concentrates.
- (v) Blood component therapy.
- (vi) Rationale of pre-transfusion testing.
- (vii) Infections transmitted in blood.
- (viii) Adverse reactions to transfusion of blood and components.
- (ix) Quality control in blood bank.

4.7.2 Skills

It is expected that the student shall correctly and independently perform the following

- Selection and bleeding of donors
- Preparation of blood components i.e. cryoprecipitates, Platelet concentrate, Fresh frozen plasma, Single donor plasma, Red blood cell concentrates.
- ABO and Rh grouping.
- Resolving ABO grouping problems by secretor status in saliva and expanded panel.
- Demonstrate familiarity with Antibody screening by
 - (i) LISS (Low-ionic salt solution)
 - (ii) Enzymes
 - (iii) AHG (Anti-Human Globulin)
- Steps to be taken if the above are positive
- Demonstrate familiarity with crossmatching by
 - (i) LISS (Low-ionic salt solution)
 - (ii) Enzymes
 - (iii) AHG (Anti-Human Globulin)
- Steps to be taken if there is incompatibility.

- Demonstrate familiarity with antenatal and Neonatal work
 - (i) Direct antiglobulin test
 - (ii) Antibody screening and titre
 - (iii) Selection of blood for exchange transfusion.
- Demonstrate familiarity with principle and procedures involved in
 - (i) Resolving ABO grouping problems.
 - (ii) Identification of RBC antibody.
 - (iii) Investigation of transfusion reaction.
 - (iv) Testing of blood for presence of
 - a. HBV (Hepatitis B virus markers)
 - b. HCV (Hepatitis C virus markers)
 - c. HIV (Human Immunodeficiency virus testing)
 - d. VDRL

4.8 Basic Sciences (in relation to Pathology)

4.8.1 Immunopathology

4.8.1.1 Knowledge

- (i) Demonstrate familiarity with the current concepts of structure and function of the immune system, its aberrations and mechanisms thereof.
- (ii) Demonstrate familiarity with the scope, principles, limitations and interpretations of the results of the following procedures employed in clinical and experimental studies relating to immunology.
 - a. ELISA techniques
 - b. Radioimmuno assay
 - c. HLA typing

4.8.1.2 Skills

- (i) Perform and interpret simple immunological tests used in diagnosis of diseases and in research procedures.
 - a. Immunoelectrophoresis
 - b. Immunofluorescence techniques especially on kidney and skin biopsies
 - c. Countercurrent electrophoresis for demonstration of antigen
 - d. Latex agglutination

- (ii) Perform and interpret:
 - a. Anti-nuclear Factor (ANF)
 - b. Anti-neutrophil cytoplasmic antibody (ANCA)

4.8.2 Electron Microscopy

4.8.2.1 Knowledge

- (i) Demonstrate familiarity with Principles and techniques of electron microscopy and the working of an electron microscope (including Transmission and scanning electron microscope: TEM and SEM).

4.8.2.2 Skills

- (i) Observe fixation, processing and staining of tissues for electron microscopy.
- (ii) Recognise the appearance of the normal subcellular organelles and their common abnormalities (when provided with appropriate photographs).

4.8.3 Enzyme Histochemistry

4.8.3.1 Knowledge

Should be familiar with the principles, use and interpretation of common enzyme histochemical procedures (Alkaline Phosphatase, Acid Phosphatase, Glucose-6-Phosphate Dehydrogenase, Succinyl Dehydrogenase, Chloracetate Esterase, Gammaglutamyl Transpeptidase and Acetyl Cholinesterase).

4.8.3.2 Skills

1. Operate the cryostat, and demonstrate familiarity with the principles of its working and be able to cut & stain tissue sections.
2. Demonstrate familiarity with the commonly used enzyme histochemical procedures.

4.8.4 Immunohistochemistry

4.8.4.1 Knowledge

Demonstrate familiarity with the principles and exact procedures of various immunohistochemical stains using both PAP (Peroxidase - Antiperoxidase) and ABC (Avidin-Biotin Conjugate) System; employing monoclonal and polyclonal antibodies.

4.8.4.2 Skills

Be able to perform immunohistochemical staining using paraffin section with at least one of the commonly used antibodies (Cytokeratin or LCA) using PAP method.

4.8.5 Molecular Biology

4.8.5.1 Knowledge

Should understand the principles of Molecular Biology especially related to the understanding of disease processes and its use in various diagnostic tests.

4.8.5.2 Skills

Should be conversant with the steps of a Polymerase Chain Reaction (PCR) and should demonstrate understanding of the steps and principles of interpretation of Western Blot, Southern blot, Northern Blot and Hybridisation procedures and other newer techniques.

4.8.6 Principles of Medical Statistics

4.8.6.1 Knowledge

Demonstrate familiarity with importance of statistical methods in assessing data from patient material and experimental studies e.g. correlation coefficients, expected versus observed, etc. and their interpretation.

4.8.6.2 Skills

Calculate means, standard deviation and standard error from the given experimental data.

4.8.7 Radio isotope and Autoradiography

4.8.7.1 Knowledge

Demonstrate familiarity with the principles of the commonly used radioisotopes in medicine and autoradiography, and the instruments used to measure radioactivity.

4.8.8 Tissue Culture

4.8.8.1 Knowledge

Demonstrate familiarity with methods of tissue culture and its utility.

4.8.9 Cytogenetics

4.8.9.1 Knowledge

Demonstrate familiarity with methods of Karyotyping and Fluorescent in-situ Hybridisation (FISH).

5. Evaluation

A standardized scheme of evaluation is necessary to train candidates in any teaching programme. Both formative and summative evaluations are therefore mandatory.

5.1 Internal (Formative) Assessment

Internal Assessment should in reality be done everyday to assess the training and to identify the weakness as well as the strength of a candidate. Thus appropriate corrective methods can be adopted at the right time so that a well-trained and competent pathologist worthy of a postgraduate degree is available for the society. However a formal assessment can be recorded at the end of every posting and reviewed every six months. **Student should present atleast one papers (Oral/Poster) in National / State level conferences during his/her training period to be eligible for appearing in MD/MS examination. A certificate from HOD should be sent to the Faculty of Medical Sciences regarding the eligibility.** Currently there is no internal assessment system in the university in the Faculty of Medical Sciences, however, there is need for incorporating internal assessment towards the final assessment of the student. As there is no system of grading/marking for internal assessment the following is proposed. These grading /marks may be communicated to the University for inclusion towards the final result of pass/fail of the students at the University examinations. This may only be incorporated as and when the Faculty of Medical Sciences takes a decision on this matter.

EXISTING	PROPOSED AMENDMENTS
Currently no internal Assessment	(i) Maintenance of logbook recording the following <ul style="list-style-type: none">• Duration and period of posting• Period of absence.• Skilled performed.• Journal Club, seminars attended/taken• Undergraduate Teaching

	<p>(ii) Research work should be reviewed/assessed every six months.</p> <p>(iii) Evaluation sheets may be incorporated for the purpose of assessment. The following points may be considered in the scheme for evaluation of presentations such as seminars and journal clubs:</p> <ol style="list-style-type: none">a. Choice of article/topic (unless specifically allotted)b. Completeness of presentationc. Clarity and cogency of presentationd. Understanding of the subject and ability to convey the same.e. Whether relevant references have been consulted.f. Ability to convey points in favour and against the subject under discussiong. Use of audio-visual aids.h. Ability to answer questionsi. Time schedulingj. Overall performance <p>(iv) In case of specific postings similar points may be assessed with regard to knowledge and skills. It is also recommended that the candidate be assessed with regard to the following:</p> <ul style="list-style-type: none">• Ability to get along with colleagues.• Conduct with patients and staff. <p>(v) Certificate of Oral /Poster presentation in National /International Conference.</p>
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5.2 University (Summative) Assessment

The university or summative examination shall be held at the end of three years of the training programme. This would include assessment of the thesis or dissertation and a formal examination on the theoretical and practical aspects of the speciality of Pathology.

1. The thesis / dissertation should be evaluated by atleast two external examiners well-versed in the topic studied. It is therefore recommended that thesis/dissertation be submitted for evaluation twelve months prior to the theory and practical examinations. The results of the evaluation should be available prior to the practical examinations.
2. If approved by the University weightage may be given to the internal assessment as communicated by the concerned department.
3. For the formal examinations there will be three external and three internal examiners.
4. There shall be four theory papers:
 - Paper I : General Principles of Pathology
 - Paper II : Haematology and Immunology
 - Paper III : Recent Advances in Pathology
 - Paper IV : Systemic Pathology
5. Practical Examination should be conducted over a minimum period of two days. The following is a guideline of the aspects to be covered:

- (i) Clinical Pathology: Discussion of a clinical case history Plan relevant investigations of the above case two investigations should be performed complete urinalysis.
- (ii) Haematology: Discuss haematology cases given the relevant history Plan relevant investigations. Perform atleast two tests preferably including coagulation exercise. Identify electrophoresis strips, osmotic fragility charts etc. Examine, report and discuss min. of twelve cases given the history and relevant blood smears and / or bone marrow aspirate smears.

- (iii) Transfusion Medicine : Perform blood grouping.
- (iv) Histopathology/Cytopathology: Examine, report and discuss 16-18 histopathology and upto 6-8 cytopathology cases given the relevant history and slides. Perform a Haematoxylin and Eosin stain and any special stain on a paraffin section. Report on a frozen section.
- (v) Gross Pathology: The student will be given relevant organs and asked to gross the specimen, give the gross findings and a provisional diagnosis in the event specimen not being available for grossing the student may be given gross specimens and asked to describe and give provisional diagnosis.
- (vi) Basic Sciences: The student will be given OSPE which may include electron micrographs results of PCR, Gel and paper electrophoresis, immunological tests including staining for direct/indirect immunofluorescence, immunohistochemistry stains, results of flowcytometry, HPLC etc.

6. Viva-voce should be conducted at every stage of the practical examination. Additionally a formal “grand” viva-voce may be held at the end of the practical examination. Questions on the thesis/dissertation may be asked at this time.

7. Marking will be done as follows:

EXISTING	PROPOSED AMENDMENTS
No uniform grading system	<p>(i) Clinical Pathology - 12 Marks</p> <ul style="list-style-type: none"> i. Clinical Case – 5 Marks ii. Biochem Ex – 5 Marks iii. Urine Ex. – 2 Marks <p>(ii) Haematology and Blood Banking – 30 Marks</p> <ul style="list-style-type: none"> i. Slides – 24 Marks ii. Hemogram – 3 Marks iii. Special Test – 3 Marks.

	<p>(iii) Histopathology & Cytology – 50 Marks</p> <ul style="list-style-type: none">i. Slides – 39 Marksii. Grossing – 6 Marksiii. H & E and Special Staining – 5 Marks <p>(iv) OSPE – 08 Marks</p> <p>GRAND TOTAL = 100 Marks</p>
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The result may finally be graded on the following percentage:

A+ > 80%

A = 75% - 79%

B+ = 70% - 74%

B = 60% - 69%

C+ = 50% - 59%

Student obtaining less than 50% should be declared as Failed.

The result should be signed by all Examiners.

The result may be sent to the University as either **PASSED OR FAILED** without indicating the Grade / Marks.