

**CHETTINAD ACADEMY OF RESEARCH & EDUCATION**

**(Deemed to be University under section 3 of the U.G.C. Act 1956)**



**REGULATIONS & SYLLABUS**

**M.D. PATHOLOGY**

**CHETTINAD ACADEMY OF RESEARCH AND EDUCATION**

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# **CHETTINAD ACADEMY OF RESEARCH AND EDUCATION**

## **Regulations for M.D. Pre and Para Clinical Courses**

### **1. INTRODUCTION:**

M.D. Pre and Para Clinical course is a three year post graduate program under the Faculty of Medicine for students with an Under Graduate Degree in Medicine. This program is a taught course that covers relevant topics and a research project in the area of specialization. This program shall be competence based and learning shall be essentially autonomous and self directed and supplemented with practical and laboratory work. The curriculum shall have modular approach to learning. The research component is through original exploration and experiments culminating in the research project. This program shall impart advanced theoretical and practical aspects of subjects previously studied in a more generalized manner at the undergraduate level.

These courses are aimed at imparting higher level of training to qualified under graduate medical students in various branches of M.D. Pre and Para Clinical subjects and to utilize this learning to the needs of community.

In exercise of the powers conferred under sub rule (a) and (g) of Rule 8 (b) of Memorandum of Association and Clause 2.1, Chapter III of Bye-laws of Chettinad Academy of Research and Education, the Academic Council hereby makes the following regulations:

### **2. SHORT TITLE AND COMMENCEMENT:**

These Regulations shall be called the "Regulations for M.D. Pre and Para Clinical Courses of Chettinad Academy of Research and Education. These regulations are subject to modifications as may be approved by the Academic Council from time to time.

### **3. GOAL:**

The goal of postgraduate medical education shall be to produce competent specialists and/or medical teachers:

- i) who shall recognize the health needs of the community and carry out professional obligations ethically and in keeping with the objectives of the national health policy
- ii) who shall have mastered most of the competencies, pertaining to the specialty, that are required to be practiced at the secondary and the tertiary levels of the health care delivery system.

- iii) who shall be aware of the contemporary advance and developments in the discipline concerned.
- iv) who shall have acquired a spirit of scientific inquiry and is oriented to the principals of research methodology and epidemiology and
- v) who shall have acquired the basic skills in teaching of the medical and paramedical professionals.

#### **4. AIMS AND OBJECTIVES:**

At the end of the Post Graduate training in the discipline concerned the student shall be able to:

- i) Recognize the importance of the concerned speciality in the context of the health needs of the community and the national priorities in the health sector.
- ii) Practice the speciality concerned ethically and in step to the principles of primary health care.
- iii) Demonstrate sufficient understanding of the basic sciences relevant to the concerned speciality.
- iv) Identify social, economic, environmental, biological and emotional determinants of health in a given case, and take them into account while planning therapeutic, rehabilitating, preventive and primitive measures/ strategies.
- v) Diagnose and manage majority of the conditions in the speciality concerned on the basis of clinical assessment, and appropriately selected and conducted investigations.
- vi) Plan and advise measures for the prevention and rehabilitation of patients suffering from disease and disability related to the speciality.
- vii) Demonstrate skills in documentation of individual case details as well as morbidity and mortality rate relevant to the assigned situation.
- viii) Demonstrate empathy and human approach towards patients and their families and exhibit interpersonal behavior in accordance with the societal norms and expectations.
- ix) Play the assigned role in the implementation of National Health Programme effectively and responsibly.
- x) Organize and supervise the chosen/assigned health care services demonstrating adequate managerial skills in the clinic/hospital or the field situation.
- xi) Develop skills as a self-directed learner, recognize continuing education needs: select and use appropriate learning resources.
- xii) Demonstrate competence in basic concepts of Research Methodology and epidemiology, and be able to critically analyze relevant published research literature.
- xiii) Develop skills in using educational methods and techniques as applicable to the teaching of Medical/ Nursing students, General Physicians and Paramedical Health Workers.
- xiv) Function as an effective leader of a health team engaged in health care, research or training.

#### **5. COMPONENTS OF THE POSTGRADUATE CURRICULUM:**

The major components of the Postgraduate curriculum shall be:

- Theoretical knowledge
- Practical and clinical skills
- Writing Thesis/Research articles
- Attitudes including communication skills
- Training in research methodology, Medical Ethics and Medico legal aspects.

## **6. NOMENCLATURE OF POSTGRADUATE COURSES:**

The nomenclature of Post Graduate Degree should be as laid down in the Post Graduate Medical Education Regulations prescribed by the Medical Council of India.

## **7. ELIGIBILITY FOR ADMISSION:**

Every student, selected for admission to a post graduate medical course in Chettinad University on acquiring M.B.B.S degree or an equivalent qualification thereto shall have obtained permanent registration with the Medical Council of India, or any of the State Medical Council(s) or shall obtain the same within a period of one month from the date of his/her admission, failing which his/her admission shall stand cancelled.

Provided that in the case of a foreign national, the Medical Council of India may, on payment of the prescribed fee for registration, grant temporary registration, for the duration of the post graduate course limited to the medical college/institution to which the candidate is admitted for the time being exclusively for pursuing post graduate studies.

Provided further the temporary registration to such foreign national shall be subject to the condition that such person is duly registered with appropriate registering authority in his own country wherefrom he has obtained his basic medical qualification and is duly recognized by the corresponding Medical Council or concerned authority.

## **8. RECOGNITION FEE AND ELIGIBILITY CERTIFICATE:**

Candidates who have passed the M.B.B.S Degree Examination other than that conducted by Chettinad Academy of Research and Education shall obtain Eligibility Certificate from this University at the time of admission and also remit recognition fee as prescribed.

## **9. REGISTRATION:**

A candidate admitted to the Post Graduate Course shall register with the University by submitting the prescribed application form for registration, duly filled in along with the prescribed fee, through the Head of the Institution.

## **10. PERIOD OF TRAINING /DURATION OF THE COURSE:**

The duration of certified study and training for the M.D. Pre and Para Clinical Courses shall be three completed years including the period of examination.

Provided that in the case of students possessing a recognised two year postgraduate diploma course in the same subject, the period of training, including the period of examination, shall be two years.

**11. COMMENCEMENT OF THE COURSE:**

The course shall ordinarily commence from 2<sup>nd</sup> May of the Academic year.

**12. CUT OFF DATES FOR ADMISSION:**

Candidates admitted up to 31<sup>st</sup> May of the Academic year shall be registered for the same Academic Year and shall be eligible to take up the final examination along with others students admitted prior to their admission. There shall be no admission of students in respect of any academic session beyond 31<sup>st</sup> May for postgraduate courses under any circumstances. The University shall not register any student admitted beyond the said date.

**13. SYLLABUS:**

The Syllabus for the course shall be as specified in the annexure to these Regulations.

**14. MEDIUM OF INSTRUCTION:**

English shall be the medium of instruction for all the subjects of study and for examination.

**15. WORKING DAYS / ATTENDANCE \***

All the candidates joining the Post Graduate training programme shall work as "Full Time Residents" during the period of training and shall attend not less than 85% (Eighty Five percent) of the imparted training during each academic year including assignments, assessed full time responsibilities and participation in all facets of the educational process as per MCI norms. 85% attendance is compulsory for all the Post Graduate students for every academic year. The Attendance details may be submitted to the Controller of Examinations at the end of every academic year. The student should also be intimated quarterly regarding the lack of attendance.

**16. CONDONATION FOR LACK OF ATTENDANCE \***

The discretionary power of condonation of shortage of attendance to appear for University Examination rests with the Vice Chancellor.

Lack of attendance can be condoned up to a maximum of 5% of the minimum attendance Required in the following exceptional circumstances:

- (i) Any illness/ accident (for which Medical certificate from a registered medical practitioner must be produced)
- (ii) Any unforeseen tragedy in the family (should produce the letter from the parent/guardian)

- (iii) Participation in NCC/NSS and other co curricular activities representing the Institution / University. (Certificate from competent authority is required)

For any of the above reasons, request shall be made by the candidate with prescribed fees to the Controller of Examination through proper channel, ten days prior to the commencement of the theory examination. Based on the recommendation of the Head of the Institution, the Controller of Examination shall obtain the approval of the Vice Chancellor for admission of the candidate to the University Examination.

**\*Sl.No.15 & 16 Amended vide XVIII meeting of Academic Council dated 15.04.2014**

**and to be replaced as detailed below; -**

***In the existing regulations for M.D. Pre – Para and clinical courses, it has been stipulated that 85% attendance is compulsory for all the Post graduate students for every academic year. This has been modified to 80% attendance in keeping with Statutory Body norms. There shall be no condonation for attendance. The attendance criteria will hence read as follow as in MCI regulations.***

***"All the candidates joining the Post Graduate training programme shall work as 'Full Time Residents' during the period of training and shall attend not less than 80% (Eighty percent) of the imparted training during each academic year including assignments, assessed full time responsibilities and participation in all facets of the educational process."***

***The Attendance details shall be submitted to the Controller of Examinations at the end of each academic year. The student should also be intimated quarterly regarding the lack of attendance.***

#### **16 (a) STIPEND AND GRANT OF LEAVE**

The Post Graduate students undergoing Post Graduate Degree / Diploma/Super-Specialty course shall be paid stipend on par with the stipend being paid to the Post Graduate students of State Government Medical Institutions / Central Government Medical Institutions, in the State / Union Territory where the institution is located. Similarly, the matter of grant of leave to Post Graduate students shall be regulated as per the respective State Government rules.

#### **17. MIGRATION / TRANSFER OF CANDIDATES:**

Under no circumstances, Migration/transfer of student undergoing any Post Graduate degree course shall be permitted by the University/Authority

#### **18. TRAINING PROGRAMME:**

The training given with due care to the Post Graduate students in the recognised institutions for the award of various Post Graduate medical degrees shall determine the expertise of the specialist and / or medical teachers produced as a result of the educational program during the period of stay in the institution.

Every institution undertaking Post Graduate training program shall set up an Academic cell or a curriculum committee, under the chairmanship of a senior faculty member, which shall work out the details of the training program in each speciality in consultation with other department faculty staff and also coordinate and or the implementation of these training Programs.

The training programmes shall be updated as and when required. The structured training programme shall be written up and strictly followed, to enable the examiners to determine the training undergone by the candidates and the Medical Council of India inspectors to assess the same at the time of inspection.

During the training for Post Graduates to be awarded, there shall be proper training in basic medical sciences related to the disciplines concerned; during the training for the degree to be awarded in basic medical sciences, there shall be training in applied aspects of the subject; and there shall be training in allied subjects related to the disciplines concerned. In all Post Graduate training programmes, both clinical and basic medical sciences, emphasis is to be laid on preventive and social aspects and emergency care facilities for autopsies, biopsies, cytopsies, endoscopic and imaging etc. also be made available for training purposes. The Post Graduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.

Training in Medical Audit, Management, Health Economics, Health Information System, basics of statistics, exposure to human behaviour studies, knowledge of pharmaco – economics and introduction to non- liner mathematics shall be imparted to the Post Graduate students.

Implementation of the training programmes for the award of various Post Graduate Degree shall include the following:-

**Basic Medical Sciences**

- (i) Lectures, Seminars, Journal Clubs, Group Discussions, Participation in laboratory and experimental work, and involvement in research studies in the concerned speciality and exposure to the applied aspects of the subject relevant to clinical specialities.

**(ii) Clinical disciplines**

In service training, with the students being given graded responsibilities in the management and treatment of patients entrusted to their care: participation in seminars, journal clubs, group discussions, clinical Meetings, Grand rounds, and Clinico - Pathological Conferences; practical training in Diagnosis and medical and Surgical treatment; training in the Basic Medical Sciences, as well as in allied clinical specialities.

The training programme shall be on the same pattern as for M.D. / M.S. in clinical disciplines; practical training including advanced Diagnostic, Therapeutic and Laboratory techniques, relevant to the subject of specialization.



## **19. MAINTENANCE OF LOG BOOK**

- a) Every Post Graduate student shall maintain a record (Log) book containing skills, the candidate as acquired during the training period certified by the various heads of department where the candidate as undergone training including outside the institution.
- b) The students shall maintain a Record Book (Log Book) of the work carried out by them & training program undergone during the period of training including details of procedures carried out independently or assisted by the candidate. The log book will be checked by the faculty members imparting the training.
- c) At the end of the course, the candidate should summarise the contents and get the record (Log) book certified by the Head of the Department.
- d) The record (Log) book should be submitted at the time of practical examination for the scrutiny of the Board of Examiners.

## **20. THESIS / DISSERTATION AND EVALUATION**

- a) All Candidates admitted to undergo M.D. Pre and Para Clinical Courses shall be assigned a topic for dissertation / thesis by the Head of the concerned unit and the title of the topic assigned to the candidates be intimated to the Controller of Examination of the University by the Head of the Department through the Head of the Institution before end of the First year.
- b) The dissertation / thesis shall be a bound volume of minimum 50 pages and not exceeding 75 pages of typed matter (double line spacing and on one side only) excluding certification, acknowledgements, annexure and bibliography.
- c) Four copies of dissertation shall be submitted six months prior to the commencement of the examination on the prescribed date to the controller of examination of the University.
- d) Two copies are to be submitted as an electronic version of the entire dissertation in a standard C.D. format mentioning the details and technicalities used in the C.D. format.
- e) The concerned Professors / Readers are to supervise and to see that the dissertation is done properly utilising the clinical materials of their own department / institution. The students must learn the design and interpretation of research studies, responsible use of informed consent and research methodology and interpretation of data and statistical analysis. They should seek the help of qualified staff members in the conduct of research. They must learn to use library and the computer-based research. This training will help them to develop skills in planning, designing and conduct of research studies.
- f) All candidates on admission will be allotted one of the department faculties who have fulfilled the requirement to be guides for purposes of guiding Dissertation/thesis. The topic for dissertation shall be finalized and discussed in the departmental faculty meeting and allotted to the individual candidates before the completion of 3 months after admission. The purpose of dissertation is to develop in the candidate the ability

to perform an independent study keeping the principles and research methodology in mind. The candidate will therefore work on the prospective problem either within the department or in collaboration with other departments. There will be continuous monitoring of the dissertation work by the guides and co-guide and by the other department staff throughout the course. The candidate will present the progress of the dissertation to the faculty on the completion of 1 ½ years for monitoring and feedback. The completed dissertation should be submitted not later than 6 months before final examination.

- g) The theory examinations shall be held sufficiently earlier than the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the start of the Clinical/Practical and Oral examination.
- h) 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. A candidate shall be allowed to appear for Theory and Practical/Clinical examination only after the acceptance of thesis by the examiners. The thesis shall be evaluated under the following heading:
  - 1) Approved
  - 2) Not approved

In all cases the approval shall be given before 3 months of the date of appearing for the examination and this will be essential before the candidate is allowed to appear for the written examination.

## **21.SCHEDULE OF EXAMINATIONS:**

The examination for M.D. Pre and Para Clinical courses shall be held at the end of 3rd academic year. An academic term shall mean six month's training period."

## **22.SCHEME OF EXAMINATIONS \***

Post Graduate Examinations shall consist of Dissertation/Thesis, Written Paper (Theory), Practical and Viva voce.

The examinations shall be organised on the basis of "Marking system" to evaluate and to certify candidate's level of knowledge, skill and competence at the end of the training.

- a. **Dissertation/Thesis:** Every candidate shall carry out and submit a Dissertation/Thesis as explained and approval of Dissertation/Thesis shall be a precondition for a candidate to appear for the final examination.
- b. A postgraduate student of a postgraduate degree course 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.

- c. **Theory:** A Written Examination shall consist of four theory papers each of three hours duration. Each paper carries 100 marks (Total 400 marks). Out of these one shall be of Basic Medical Sciences and one shall be of Recent advances. The theory examinations shall be held well before the Practical examination, so that the answer books can be assessed and evaluated well before the commencement of the Practical and Oral examination.
- d. **Practical Examination:** Practical Examination shall be conducted to test the knowledge and competence of the candidates for making valid and relevant observations based on the experimental / laboratory studies and ability to perform such studies as are relevant to the subject.
- e. **Oral Examination:** The Oral examination shall be thorough and shall aim at assessing the candidate's knowledge and competence about the subject, investigative procedures, therapeutic technique and other aspects of the speciality, which form a part of the examination.
- f. **Pedagogy:** Pedagogy to evaluate the communication and teaching skills, and subject knowledge of the student. The topic for Pedagogy will be given at the end of 1<sup>st</sup> day of the Practical Examination.

<b>THEORY</b>	
No. of Theory Papers	4
Marks for each Theory Paper	*100
Total marks for Theory Papers	400
Passing Minimum for Theory	200/400
Total marks for PRACTICAL	300
Passing Minimum for Practical	150/300
Viva voce	50
Pedagogy	50
Passing minimum for Practical including Viva voce / Pedagogy	200/400

- i) If any candidate fails even under one head, he/she has to re-appear for whole examination.
- ii) Theory papers consist of 2 essay questions of 25 marks each (2 X 25 = 50) & 5 short notes of 10 marks each (5 X 10 = 50). Total =100 marks each.

**\*SI.No.22 (ii) Amended vide XVIII meeting of Academic Council Dated**

**15.04.2014 and to be replaced as detailed below:**

**Resolved to approve 2 Essay Questions (2 x 20 marks ) and 10 short notes (10 x 6 marks) for all post graduate medical / broad and higher speciality courses which will take effect for the students appearing for first time examination from March 2015 .**

**Resolved to approve 2 essays (2 x 20 marks) and 6 short notes (6 x 10 marks) for theory paper in all M. D/ M.S. courses by the Academic Council in its XX meeting held on 25.03.2015.**

**\*Resolved to approve that an examinee should obtain minimum 40% marks in each theory paper and not less than 50% marks cumulatively in all the four papers in P.G. degree examination to be cleared as passed which will be implemented prospectively. (Academic Council in its XX meeting held on 25.03.2015).**

### **23.EXAMINERS:**

All the Post Graduate Examiners shall be recognized Post Graduate Teachers holding recognized post graduate qualification in the subject concerned. For all Post Graduate Examinations, the Minimum number of examiners shall be Four, out of which at least two (50%) shall be external examiners who shall be invited from other recognized universities from outside the state / outside university. The remaining two will be internal examiners.

The qualification and teaching experience for appointment of examiner shall be as detailed below and by the guidelines of Medical Council of India issued from time to time.

No person shall be appointed as an internal examiner in any subject unless he/she has three years experience as recognized PG teacher in the concerned subject. For external examiners, he/she should have minimum six years of experience as recognized PG teacher in the concerned subject'. "An examiner shall ordinarily be appointed for not more than two consecutive terms"

Under exceptional circumstances, examinations may be held with 3 (three) examiners provided two of them are external and Medical Council of India is intimated for the justification of such action prior to publication of result for approval. Under no circumstances, result shall be published in such cases without the approval of Medical Council of India.

### **24. MAXIMUM NUMBER OF CANDIDATES:**

The maximum number of candidates to be examined in clinical/practical and oral on any day shall not exceed eight for M.D. Pre and Para Clinical Courses.

### **25.\*NUMBER OF EXAMINATIONS:**

The University shall conduct not more than two examinations in a year, for any subject, with an interval of not less than 4 and not more than 6 months between the two examinations. The examination shall be conducted in September and March.

**\*Sl. No.25 Amended in XXI meeting of Academic Council dated 22.07.2015**

**Resolved to approve the commencement of M.D. /M.S. University examination in April (for Regular Batch) and October (for Supplementary Batch).**

## **26. REVALUATION OF ANSWER PAPERS:**

There shall be no revaluation of answer papers. However, re-totaling is allowed in the failed subjects with the payment of required fee fixed by the University within 15 days from the date of receipt of statement of marks.

## **SYLLABUS**

### **M.D. (PATHOLOGY)**

#### **PROGRAMME OBJECTIVES**

A candidate upon successfully qualifying in the M.D. (Pathology) examinations should be -

- 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 management of the patient. (Wherever possible the course should provide an opportunity to give some knowledge of the newer diagnostic specialties so that the candidate on qualifying in MD (Pathology) should be able to pursue further specialisation and training in these fields)
- 2) Able to teach and share his knowledge and competence with others. (He / She should be imparted training in teaching methods in the subject which may enable them to take up teaching assignments in Medical Colleges / Institutes. The MD (Pathology) course should therefore provide an opportunity to candidates to teach colleagues and students)
- 3) Capable of pursuing clinical and laboratory-based research. He / She should be introduced to basic research methodology so that they can conduct fundamental and applied research.
- 4) Capable of establishing a top-notch quality assurance programme in the clinical laboratory In order to ensure the delivery of high quality diagnostic services.

#### **SPECIFIC LEARNING OBJECTIVES:**

##### **COGNITIVE DOMAIN**

- 1) To be able to diagnose routine and complex clinical problems by examining the Surgical Pathology and Cytopathology specimens, Blood, body fluid, stools and Bone Marrow samples.
- 2) To be able to Interpret and correlate clinical and laboratory data so that clinical manifestations of disease can be explained.
- 3) To be able to Advice on the appropriate specimens and tests necessary to arrive at a diagnosis in a problematic case.
- 4) To be able to correlate clinical and laboratory findings with Pathology findings at autopsy and identify discorrelations and the causes of death due to diseases

- 5) Should be able to teach Pathology to undergraduates, postgraduates, nurses and paramedical staff including laboratory personnel.
- 6) To be able to Plan, execute, analyse and present research work.
- 7) Make and record observations systematically and maintain accurate records of tests and their results for reasonable periods of time. Identify problems in the laboratory, offer solutions thereof & maintain a high order of quality control.
- 8) To be able to manage a blood bank and practice transfusion medicine
- 9) Be capable of safe & effective disposal of laboratory waste.
- 10) Able to supervise and work with subordinates and colleagues in a laboratory.

#### PSYCHOMOTOR DOMAIN

- 1) To be able to perform most of the routine tests in a Pathology Laboratory including grossing of specimens, processing, cutting of paraffin and frozen sections, making smears, and staining.
- 2) To be able to collect specimens by routine procedures such as venepuncture, finger-prick, fine needle aspiration of superficial lumps and bone-marrow aspirates, and provide appropriate help to colleagues performing an invasive procedure such as a biopsy or an image guided biopsy.
- 3) To be able to perform a detailed autopsy to establish the cause of death
- 4) Should be familiar with the function, handling and routine care of equipment in the laboratory.
- 5) To be familiar with special procedures like immunofluorescence, immunohistochemistry, electron microscopy and molecular diagnostic techniques.

#### 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. Should seek and give second opinion only where necessary.
- 2) Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel & to respect the rights of the patient including the right to information and second opinion.
- 3) Provide leadership and inspire members of the team with whom he/she is involved within the fields of diagnostic pathology, teaching and research.
- 4) Develop communication skills to effectively interact with patients, relatives, peers and paramedical staff; to express professional opinions; to prepare professional reports; to deliver effective lectures and participate in other forms of teaching.

#### **SCOPE OF TRAINING**

It must be appreciated that within the time period of the Training programme which covers a wide range of subjects and subspecialties, it is difficult, if not impossible, to achieve full proficiency in all the technological methods and available theoretical knowledge. The following categorization is recommended.

1. **HIGH DEGREE OF PROFESSIONAL COMPETENCE:** In the following fields a high degree of professional competence and theoretical knowledge is expected. The candidate is expected to know both the theoretical as well as practical aspects especially related to diagnosis of appropriate diseases.

a. **Pathologic Anatomy** (Surgical Pathology and Cytopathology): The study of Pathologic Anatomy includes all aspects of Pathology as encompassed in the branches of General Pathology and Systemic Pathology. Therefore, only the broad outlines are provided and a compendium of chapters as available in standard books is avoided.

i. General Pathology: Normal cell and tissue structure and function. The changes in cellular structure and function in disease; Causes of disease and its pathogenesis; Reaction of cells, tissues, organ systems and the body as a whole to various sublethal and lethal injury.

1. The scope of General Pathology is vast and the above is a guideline that in essence covers all aspects.

i. Systemic Pathology: The study of normal structure and function of various organ systems and the aetio-pathogenesis, gross and microscopic alterations of structure and function of these organ systems in disease.

1. All organ systems are to be studied. This forms the basis of Histopathology (Surgical Pathology), Cytopathology, Autopsy Pathology and clinico-pathological correlation.

b. **Haematology:** The study of Haematology includes all aspects of the diseases of the blood and bone marrow. This would involve the study of the normal and the causes of diseases and the changes thereof.

2. **REASONABLE WORKING KNOWLEDGE:** In the following fields the student is expected to achieve reasonable working knowledge and diagnostic skill, and be able to run independently a routine service in a teaching hospital, and if necessary, at some future date, with some additional effort acquire the level of competence. Some centers have separate degrees/diplomas/postgraduate courses for some of these subjects. However, current practice of pathology, either institutional or otherwise demands a reasonable working knowledge of these subjects and therefore until such time as the situation demands, these subjects should be an integral part of post-graduate training in pathology.

a. Laboratory Medicine (Clinical Chemistry/Clinical Biochemistry/Chemical Pathology and Microscopy/Clinical Pathology including Parasitology).

b. Transfusion Medicine (Blood-Banking).

3. **GENERAL ACQUAINTANCE:** Following are the fields 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.

a. Immunopathology

b. Electron microscopy

c. Histochemistry

d. Immunohistochemistry

e. Use of radioisotopes

f. Cytogenetics & Molecular pathology

g. Tissue culture

h. Medical statistics

## **COURSE CONTENT (Syllabus)**

A postgraduate appearing for the MD degree is supposed to have acquired not only professional competence expected of a well-trained specialist but also academic maturity, a capacity to reason and critically analyse a set of scientific data. He is supposed to keep himself abreast with the latest developments in the field of the pathology and related sciences. A brief outline of what is expected to be learnt during each of the postings in the different sections/laboratories during the MD Course is given under each head.

### **1. Surgical Pathology:**

#### **a. Knowledge**

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

#### **b. Skills**

- i. 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.
- ii. A student will be able to demonstrate ability to perform a systematic gross examination of the tissues including the taking of appropriate tissue sections and in special cases as in intestinal mucosal biopsies, muscle biopsies and nerve biopsies, demonstrate the orientation of tissues in paraffin blocks.
- iii. Given the relevant clinical, operative and radiological data, the student should be able to identify and systematically and accurately describe the chief histomorphological alterations in the tissue received in the surgical pathology service. He/she 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. He/she 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.
- iv. Start the automatic tissue-processing machine and verbally demonstrate his understanding of the principles of its running.
- v. Process a tissue, make a paraffin block and cut sections of good quality on a rotary microtome.
- vi. Stain paraffin sections with at least the following:
  1. Haematoxylin and eosin
  2. Stains for collagen, elastic fibers and reticulin
  3. Iron stain
  4. PAS stain
- vii. Demonstrate understanding of the principles of:
  1. Fixation of tissues
  2. Processing of tissues for section cutting
  3. Section cutting and maintenance of related equipment
  4. Differential (Special) stains and their utility



- viii. 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, and correctly diagnose at least 75 per cent of the lesions within 15 minutes.
- ix. Demonstrate the understanding of the utility of various immunohistochemical stains especially in the diagnosis of tumour subtypes.

## **2. Autopsy Pathology**

### **a. Knowledge**

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

### **b. Skills**

- i. 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 in at least 90% of the autopsies in an average teaching hospital. In exceptional circumstances, help of a frozen section may be obtained.
  - 1. If non-medicolegal autopsies are not available each student/candidate should be made to dissect organs from at least five medico-legal autopsies.
- ii. 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.
- iii. 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.

## **3. Cytopathology**

### **a. Knowledge**

- i. Should possess the background necessary for the evaluation and reporting of Cytopathology specimens.
- ii. Demonstrate verbal familiarity with, and guide the clinical residents in the following, keeping in view the special requirements of each case (Cyto-hormonal status, malignancy, infection, etc.)
  - 1. Choice of site from which smears may be taken (as in the case of vaginal smears)
  - 2. Type of smear (morning specimen, after specimen, pre-menstrual specimen, etc.)
  - 3. Method of obtaining various specimens (urine sample, gastric smear, colonic lavage etc.)

### **b. Skills**

- i. Independently prepare and stain good quality smears for cytopathologic examination and be conversant with the principles and preparation of solutions of stains.
- ii. Demonstrate conversance with the techniques for concentration of specimens: i.e. various filters and CytoCentrifuge.

- iii. 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.
- iv. Given the relevant clinical data, he/she should be able to independently and correctly :
  - 1. Evaluate hormonal status in all cases as may be required.
  - 2. 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 and positive.
  - 3. Demonstrate ability in the technique of screening and dotting the slides for suspicious cells.
  - 4. Indicate correctly the type of tumour, if present, in at least 75% cases.
  - 5. Identify with reasonable accuracy the presence of organisms, fungi and parasites in at least 75% of cases.

#### **4. Haematology**

##### **a. Knowledge**

- i. Should demonstrate the capability of utilising the principles of the practice of Haematology for the planning of tests, interpretation and diagnosis of diseases of the blood and bone marrow.
- ii. Should be conversant with various equipment used in the Haematology laboratory.
- iii. Should have knowledge of automation and quality assurance in Haematology.

##### **b. Skills**

- i. Correctly plan a strategy of investigating at least of the cases referred for special investigations in the Hematology Clinic and give ample justification for each step in consideration of the relevant clinical data provided.
- ii. Correctly and independently perform the following special tests, in addition to doing the routine blood counts:
  - 1. Haemogram including Reticulocyte and Platelet counts.
  - 2. Bone marrow staining including stain for iron
  - 3. Blood smear staining
  - 4. Cytochemical characterization of leukemia with special stains like Peroxidase, Leukocyte Alkaline Phosphatase (LAP), PAS, Sudan Black, Oil Red O, Acid Phosphatase (including Tartarate resistant) and Non-specific esterase
  - 5. Osmotic fragility
  - 6. Fetal Haemoglobin
  - 7. Sickling phenomenon
  - 8. Bleeding time
  - 9. Clotting time
  - 10. Prothrombin time (PT)
  - 11. Activated partial thromboplastin time (APTT)
  - 12. Haemoglobin electrophoresis, paper electrophoresis
  - 13. Coombs Test
  - 14. Clot Solubility Test
- iii. Demonstrate familiarity with the principle and utility in diagnosis of the following:
  - 1. Red cell indices
  - 2. Plasma haemoglobin
  - 3. Haemosiderin in urine

4. Presumptive tests for complete antibodies
  5. Ham's Acid test
  6. Sugar water test
  7. Serum electrophoresis
  8. Platelet function tests including platelet aggregation and adhesion and PF3 release
  9. Russell's viper venom time (RVVT)
  10. Coagulation Factor assays
  11. Screening for coagulation factor inhibitors
  12. Fibrin Degradation Products (FDP), D-Dimers (xiii) Monitoring of anticoagulant therapy
  13. 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)
  14. Serum ferritin
  15. Serum iron and total iron binding capacity
  16. Immunophoretic typing
  17. Cytogenetics
- iv. Demonstrate verbally and in writing, his/her understanding of the principles of the above tests their utility in diagnosis and interpretation of results.
  - v. Perform a successful bone marrow aspiration/iliac crest biopsy and stain the peripheral and bone marrow smears with Romanowsky stains.
  - vi. 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.
  - vii. Possess working knowledge of the following:
    1. Bone marrow transplantation
    2. Prenatal diagnosis of genetic haematological diseases
    3. Molecular biology of haematological diseases

## **5. Laboratory Medicine**

### **a. Knowledge**

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

### **b. Skills**

- i. 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.

- ii. Demonstrate familiarity with and successfully perform a routine Urinalysis including Physical, Chemical and Microscopic, examination of the sediment.
- iii. Demonstrate familiarity with and successfully perform the macroscopic and microscopic examination of Faeces and identify the ova and cysts of common parasites.
- iv. Independently and successfully perform a complete examination; physical, chemical and cell content of Cerebrospinal Fluid (C.S.F). , Pleural and Peritoneal fluid.
- v. Successfully perform an examination of Peripheral Blood for the commonly occurring parasites.
- vi. Independently perform a Semen analysis.
- vii. Independently and correctly perform at least the following Quantitative Estimations by Manual Techniques and/or Automated Techniques.
  1. Blood urea
  2. Blood sugar
  3. Serum Proteins total & fractional
  4. Serum Bilirubin total & fractional
  5. Serum amylase
- viii. Demonstrate familiarity with the following Quantitative Estimations by Automated Techniques.
  1. Serum cholesterol\*
  2. Uric acid
  3. Serum Transaminases (ALT and AST/SGOT and SGPT) (iv) Serum Alkaline Phosphatase
  4. Creatinine\*
  5. Serum calcium and phosphorous
  6. Serum Electrolyte (Na<sup>+</sup> and K<sup>+</sup>)
    - a. \*Must also be familiar with the manual method
- ix. Demonstrate familiarity with:
  1. Determination of bicarbonates
  2. Blood gas analysis.
- x. Prepare standard solutions and reagents relevant to the above tests, including the preparation of normal solution, molar solution and Buffers.
- xi. Explain the principle of Instrumentation, use and application of the following instruments.
  1. Photoelectric colorimeter
  2. Spectrophotometer
  3. pH meter
  4. Flame photometer
  5. Centrifuge
  6. Analytical balance
  7. Electrophoresis apparatus
  8. Light Microscope
  9. Blood gas analyser

## 6. Transfusion Medicine (Blood Banking)

### a. 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

**b. Skills:**

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

- i. Selection and bleeding of donors
- ii. Preparation of blood components i.e. Cryoprecipitates, Platelet concentrate, Fresh Frozen Plasma, Single Donor Plasma, Red Blood Cell concentrates.
- iii. ABO and Rh grouping.
- iv. Resolving ABO grouping problems by secretor status in saliva and expanded panel.
- v. Demonstrate familiarity with Antibody screening by
  - 1. LISS (Low-ionic salt solution)
  - 2. Enzymes
  - 3. AHG (Anti-Human Globulin)
- vi. Steps to be taken if the above are positive.
- vii. Demonstrate familiarity with Cross-matching by
  - 1. LISS (Low-ionic salt solution)
  - 2. Enzymes
  - 3. AHG (Anti-Human Globulin)
- viii. Steps to be taken if there is incompatibility.
- ix. Demonstrate familiarity with Antenatal and Neonatal work
  - 1. Direct antiglobulin test
  - 2. Antibody screening and titre
  - 3. Selection of blood for exchange transfusion
- x. Demonstrate familiarity with principle and procedures involved in
  - 1. Resolving ABO grouping problems.
  - 2. Identification of RBC antibody.
  - 3. Investigation of transfusion reaction.
  - 4. 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

**7. Basic Sciences (in relation to Pathology)**

**a. Immunopathology**

**i. Knowledge**

- 1. Demonstrate familiarity with the current concepts of structure and function of the immune system, its aberrations and mechanisms thereof.
- 2. 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. Radio-immunoassay
- c. HLA typing

**ii. Skills**

- 1. Perform and interpret simple immunological tests used in diagnosis of diseases and in research procedures.
- 2. Immunoelectrophoresis
- 3. Immunofluorescence techniques especially on kidney and skin biopsies
- 4. Countercurrent electrophoresis for demonstration of antigen
- 5. Latex agglutination
- 6. Perform and interpret:
- 7. Anti-nuclear Factor (ANF)
- 8. Anti-neutrophil cytoplasmic antibody (ANCA)

**b. Electron Microscopy**

**i. Knowledge**

- 1. 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)

**ii. Skills**

- 1. Perform proper fixation, processing and staining of tissues for electron microscopy.
- 2. Recognise the appearance of the normal subcellular organelles and their
- 3. Common abnormalities (when provided with appropriate photographs).

**c. Enzyme Histochemistry**

**i. Knowledge**

- 1. Should be familiar with the principles, use and interpretation of common enzyme histochemical procedures (Alkaline Phosphatase, Acid Phosphatase, Glucose6-Phosphate Dehydrogenase, Succinyl Dehydrogenase, Chloroacetate Esterase, Gammaglutamyl Transpeptidase and Acetyl Cholinesterase).

**ii. Skills**

- 1. Operate the cryostat, and demonstrate familiarity with the principles of its working and be able to stain tissue sections for some cell constituents.
- 2. Demonstrate familiarity with the commonly used enzyme histochemical procedures.

**d. Immunohistochemistry**

**i. Knowledge**

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

**ii. Skills**

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

**e. Molecular Biology**

**i. Knowledge**

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

**ii. Skills**

1. 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.

**f. Principles Of Medical Statistics**

**i. Knowledge**

1. 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.

**ii. Skills**

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

**g. Radio Isotope and Autoradiography**

**i. Knowledge**

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

**h. Tissue Culture**

**i. Knowledge**

1. Demonstrate familiarity with methods of tissue culture.

**i. Cytogenetics**

**i. Knowledge**

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

*Important Note*

1. All efforts must be made so that the student gets an opportunity to be familiar with all the aspects of expected training that have been mentioned. If necessary extra-mural postings may be considered to take care of any likely shortcomings in the training. It must be emphasised that the training for the degree of MD (Pathology) is not merely to produce a diagnostic pathologist well versed with routine diagnosis but also to ensure all-round development of the student who will be an asset to the society as a responsible teacher and scientist.
2. Development of knowledge and skills in fields not mentioned explicitly should be encouraged. Thus knowledge in imaging techniques and their interpretation would be an asset while interpreting diseases of bones and joints. Knowledge regarding the nature of therapy for various diseases would be helpful not only in identifying iatrogenic diseases but also in actively participating in the diagnosis and management of patients. The relevance of every report of a patient thus becomes more easily understood. No branch of medicine is today restricted or isolated. The overall well-being of the sick is a team-effort. The student must learn that working, as a team is essential today.

3. It should be the endeavor of every training programme to emphasise on quality control and also on the limitations of each and every test.

## **RESEARCH**

It is recommended that students submit a Thesis or Dissertation six months prior to examinations as a partial fulfillment to the award of the degree of MD (Pathology). Students should be encouraged to present papers in conferences and publish papers in peer reviewed journals. Due emphasis must be laid on the importance of obtaining ethical clearance from appropriate committees for both animal and human studies.

A short course on research methodology may be necessary. Skills will be acquired largely depending on the topic of research. The following points are guidelines to what may be expected of the student at the end of the course.

- a. Recognise a research problem - basic or applied
- b. Clearly state the objectives in terms of what is expected to be achieved in the end.
- c. Plan rational approaches with appropriate controls with full awareness of the statistical validity of the size of experimental material.
- d. Carry out most of the technical procedures required for the study.
- e. Accurately and objectively record on systematic lines the results and observations made.
- f. Analyse the data with the aid of an appropriate statistical analysis, if necessary.
- g. Interpret the observations in the light of existing knowledge and highlight in what ways the study has advanced existing knowledge on the subject and what further remains to be done.
- h. Take photomicrographs, of a quality fit for publication in an international journal
- i. Write the thesis or a scientific paper in accordance with the prescribed instructions, as expected of international standards.

It should be appreciated that a clear definition of the goals and precise objectives before starting a research project is essential. These must be stated in clear, unambiguous terms as ultimate results of the study and not as the methods of approach to the problem.

## **TRAINING METHODS**

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

1. Collection of specimens including Fine needle aspiration of superficial lumps.
2. Grossing of specimens.
3. Performing autopsies.
4. Discussions during routine activities such as during signing out of cases.
5. Presentation and work-up of cases including the identification of special stains and ancillary procedures needed.
6. Clinico-pathological conferences.
7. Intradepartmental and interdepartmental conferences related to case discussions.



8. Conferences, Seminars, Continuing Medical Education (CME) Programmes.
9. Journal Club.
10. Research Presentation and review of research work.
11. Guest and in-house lectures.
12. Participation in workshops, conferences and presentation of papers etc.
13. Laboratory-work.
14. Use and maintenance of equipment.
15. Maintenance of records.
16. Teaching undergraduates and paramedical staff.

**Thesis:** For the purpose of thesis/dissertation, as far as possible, each individual must be given the freedom of choice as far as the subject/topic he/she would like to study. He/she should be given an opportunity to apprise himself/herself with topics of current research interests of each member of the faculty. In case the student does not have a preference of his/her own, topics are to be suggested by the faculty who ensure that there is generally an equitable distribution of the postgraduates among the faculty. It is obvious that the thesis or dissertation will be on a topic on which there is general interest, expertise and facilities within the department. Interdepartmental collaboration should be encouraged to widen the scope and outlook of the research proposal and training.

### **STRUCTURED TRAINING PROGRAMME**

A structured scheme of training is recommended so that every student is exposed to different aspects of the subject and acquires sufficient knowledge and skill as expected from the course. The three-year training programme for the M.D. 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.

Section	Subject	Duration (months)
1.	Surgical Pathology and Autopsy	12
2.	Surgical Pathology Techniques	1
3.	Haematology	5
4.	Cytopathology	4
5.	Laboratory Medicine	4
6.	Transfusion Medicine/Blood Bank	2
7.	Basic Sciences including Immunopathology, Electron microscopy, Molecular Biology, Research Techniques etc.	2
8.	Elective/reorientation	1
9.	Thesis/Dissertation Work	4
	Total	35

Extramural postings to reputed institutions or to other institutions to learn techniques not available in the parent institution and also to acquire knowledge and skill in some aspects of the course may be encouraged.

## EVALUATION

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

### 1. Internal (Formative) Assessment

Internal Assessment should in reality be done every day to assess the training and to identify the weakness as well as the strength of the 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.

- a. A logbook should be maintained recording the duration of posting, the period of absence, if any, skills performed, and remarks if any by the teacher/faculty member. The logbook should also record journal clubs, seminars attended and partaken as well as undergraduate teaching activities the candidate has participated.
- b. Research work should be assessed or reviewed every six months. The protocol and the final results should be presented to the entire department. Evaluation sheets may be incorporated for the purpose of assessment.
- c. The following points may be considered in the scheme for evaluation of presentations such as seminars and journal clubs:
  - (i) Choice of article/topic (unless specifically allotted)
  - (ii) Completeness of presentation
  - (iii) Clarity and cogency of presentation
  - (iv) Understanding of the subject and ability to convey the same
  - (v) Whether relevant references have been consulted
  - (vi) Ability to convey points in favour and against the subject under discussion
  - (vii) Use of audio-visual aids
  - (viii) Ability to answer questions
  - (ix) Time scheduling
  - (x) Overall performance

In the 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:

- Ability to get along with colleagues
- Conduct with patients and staff

Grading may be done in one of the following ways:

- (i) Awarding actual marks
- (ii) Awarding scores:

0 = Poor;  
1 = below average  
2 = Average  
3 = above average  
4 = Good

- (iii) Awarding grades  
A+ = 90% - 100%

- A = 80% - 89%
- A- = 75% - 79%
- B+ = 70% - 74%
- B = 60% - 69%
- B- = 50% - 59%
- C = < 50%

The grades must be endorsed by more than one faculty member or an average obtained by pooling the grades of different faculty members. This must be conveyed to the candidate periodically (at least once in every six months) so that the candidate knows where he or she stands.

## 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 specialty of Pathology.

**The thesis/dissertation** should be evaluated by at least two external examiners well-versed in the topic studied. It is therefore recommended that thesis/dissertation be submitted for evaluation six months prior to the theory and practical examinations. The results of the evaluation should be available prior to the practical examinations. If necessary grades may be awarded as given above.

**Examiners:** For the formal examinations there should be two external and two internal examiners.

### Theory Papers

The Theory Papers shall be set preferably by the external examiners

There shall be four theory papers:

Paper	Subject	Maximum Marks
1.	General Pathology, Pathophysiology, Immunopathology & Cytopathology	100
2.	Haematology , Transfusion Medicine (Blood Banking) and Laboratory Medicine including Quality Assurance	100
3.	Systemic Pathology	100
4.	Recent advances & applied aspects	100

**Practical Examination:** Examination should be conducted over a minimum period of two days. (**Total Marks 400**)

The following is a guideline of the aspects to be covered

	Topic with marks	Description of exercises
1.	Clinical Pathology 25	Discussion of a clinical case history Plan relevant investigations of the above case Two investigations should be performed Complete urinalysis
2.	Haematology 75	Discuss haematology cases given the relevant history; Plan relevant investigations

		Perform at least two tests preferably including coagulation exercise; Identify electrophoresis strips, osmotic fragility charts etc. Examine, report and discuss ten cases given the history and relevant blood smears and/ or bone marrow aspirate smears
3.	Transfusion Medicine 25	Perform blood grouping; Perform the necessary exercise given a relevant history
4.	Histopathology Cytopathology 75+45	Examine, report and discuss ten to twelve histopathology and three to five 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
5.	Autopsy: 25	Given a case history and relevant organs (with or without slides) give a list of anatomical diagnosis in a autopsy case.
6.	Gross Pathology: 30	Describe findings of gross specimens, give diagnosis and identify the sections to be processed (bitting)
7.	Basic Sciences and immunohistochemistry 25	Identify electronmicrographs Identify gels, results of PCR, immunological tests including staining for direct/indirect immunofluorescence; Identify histochemical stains
8.	Quality Assurance 25	Identify the quality problems in the samples/scenario provided and suggest appropriate solutions
9.	Pedagogy 50	

**Viva-voce (50)** is expected to 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.

Marking may be done by any of the methods suggested in 9.1.4. Grading rather than actual marking is to be preferred because in a post-graduate examination, which is currently subjective to a large extent, it may be extremely difficult to differentiate performance differences within ranges of 1% to 5%.

### **READING MATERIAL**

A complete list of reading material is extremely difficult to provide for the postgraduate student in Pathology. In any postgraduate course reading should not be limited only to the subject of specialisation. One is expected to acquire as much theoretical and practical knowledge as possible. There can be no set guidelines in this regard. Students must be encouraged to utilise the Internet and similar information technologies to further their knowledge and to supplement conventional reading.

The following is an incomplete list of reading material that may be helpful to a postgraduate student of Pathology. The habit of referring to current literature and the method of searching for literature must be made a mandatory component of the training.

### **Journals and Periodicals**

1. Acta Cytologica
2. The American Journal of Pathology
3. The American Journal of Surgical Pathology
4. The American Journal of Hematology
5. The American Journal of Clinical Pathology
6. Archives of Pathology and Laboratory Medicine
7. British Journal of Haematology
8. Blood
9. Diagnostic Cytopathology
10. Histopathology
11. Human Pathology
12. Indian Journal of Cytology
13. Indian Journal of Pathology and Microbiology
14. Journal of Pathology
15. Journal of Clinical Pathology
16. Laboratory Investigation
17. Modern Pathology
18. Pathology
19. Seminars in Hematology
20. Seminars in Diagnostic Pathology
21. Virchows Archives
22. Year Book Series
23. Recent Advances Series

The list of journals is incomplete. It is also expected that the students make it a habit to read other journals because pathology is not confined to pathology journals alone. Specialty journals such as those related to oncology (Cancer, British Journal of Cancer, International Journal of Cancer, Cancer Research, Journal of National Cancer Institute, Journal of Surgical Oncology etc.) are excellent sources of information regarding the pathology of tumours. Similarly journals related to Cardiology, Chest Diseases, Dermatology, Endocrinology, Gynecology, Gastroenterology, Hepatology, Nephrology, Neurology, Neurosurgery, etc. are invaluable sources of material on the appropriate pathology. Further Journals such as Lancet, New England Journal of Medicine, Nature and Science are a must for every postgraduate student who wishes to keep abreast with what is new in medical science and therefore in pathology.

### **Books**

1. Histology for Pathologists. Stephen S. Sternberg (Ed), Raven Press, New York.
2. General Pathology JB Walter, MS Israel. Churchill Livingstone, Edinburgh
3. Robbin's Pathologic Basis of Disease Ramzi S. Cotran, Vinay Kumar, Stanley L Robbins WB Saunders Co., Philadelphia.
4. Pathology Emanuel Rubin, John L Farber. JB Lippincott Co., Philadelphia
5. Anderson's Pathology. John M Kissane (Ed). The CV Mosby Co., St. Louis
6. Ackerman's Surgical Pathology. Juan Rosai Mosby. St. Louis
7. Diagnostic Surgical Pathology. Stephen S Sternberg. Lippincott, William Wilkins. Philadelphia
8. Systemic Pathology. W St. C Symmers (Series Ed) Churchill Livingstone, Edinburgh
9. Diagnostic Histopathology of Tumours. Christopher DM Fletcher (Ed). Churchill Livingstone; Edinburgh.
10. Soft Tissue Tumors. Franz M Enzinger, Sharon W Weiss. Mosby, St. Louis
11. Cardiovascular Pathology Malcolm D Silver Churchill Livingstone New York.

12. Pathology of Pulmonary Diseases Mario J Saldhana. JB Lippincott Co., Philadelphia
13. Spencer's Pathology of the Lung. PS Hasleton. Mc Graw-Hill, New York.
14. Dahlin's Bone Tumors. K Krishnan Unni. Lippincott-Raven Publishers, Philadelphia, New York
15. Bone Tumours Andrew G Huvos WB Saunders Co. Philadelphia
16. Greenfield's Neuropathology. J Hume Adams (Ed) Edward Arnold, London.
17. Russell & Rubeinstein's Pathology of the Tumours of the Nervous System. Darrell D Bigna. Roger E Mc Lendon, Janet M Bruner (Eds.), Arnold, London
18. Rosen's Breast Pathology. Paul Peter Rosen. Lippincott-Raven Publishers, Philadelphia, New York.
19. Pathology of the Gastrointestinal Tract. S-I Chun Ming. Harvey Goldman (Eds.) Williams & Wilkins, Baltimore.
20. Haynes and Taylor Obstetrical & Gynaecological Pathology. H Fox, M Wells. Churchill Livingstone New York.
21. Heptinstall's Pathology of the Kidney. J Charles Jenette, Jean L Olson, Melvin M Schwartz, Fred G Silva (Eds.). Lippincott-Raven Publishers, Philadelphia, New York.
22. Potter's Pathology of the Fetus & Infant. Enid Gilbert-Barnes (Ed). Mosby, St. Louis
23. Lever's Histopathology of the Skin, David Elder (Ed), Lippincott-Raven Publishers, Philadelphia, New York
24. Theory and Practice of Histological Techniques, Bancroft JD, Stevens A, Turner DR, Churchill Livingstone, Edinburgh
25. Histotechnology - A Self Instructional Text, Carson FL, American Society of Clinical Pathologists, Chicago
26. Histochemistry Theoretical and Applied. AG Everson Pearse. Churchill Livingstone, Edinburgh
27. Manual & Atlas of Fine Needle Aspiration Cytology. Svante R Orell, Gregory F Sterrett, Max N-Walters, Darrel Whitaker. Churchill Livingstone, London
28. Cytopathology. Zuher M Naib. Little Brown and Company, Boston.
29. Diagnostic Cytology and its Histopathologic Basis, Koss LG, J.B. Lippincott, Philadelphia
30. Comprehensive Cytopathology, Bibbo M, W.B. Saunders Co., Philadelphia
31. William's Hematology Beutler E, Lichtmann MA, Coller BS, Kipps TJ, McGraw Hill, New York
32. Postgraduate Hematology Hoffbrand AV, Lewis SM, Tuddenham EGD, Butterworth Heinemann, Oxford
33. Wintrobe's Clinical Hematology, Lee GR, Foerster J, Lupeus J, Paraskevas F, Gveer JP, Rodgers GN, Williams & Wilkins, Baltimore
34. Practical Haematology, Dacie JV, Lewis SM, Churchill Livingstone, Edinburgh
35. Bone Marrow Pathology, Bain BJ, Clark DM, Lampert IA, Blackwell Science, Oxford
36. Leukemia Diagnosis- A guide to the FAB Classification, Bain BJ, J.B. Lippincott, Philadelphia
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