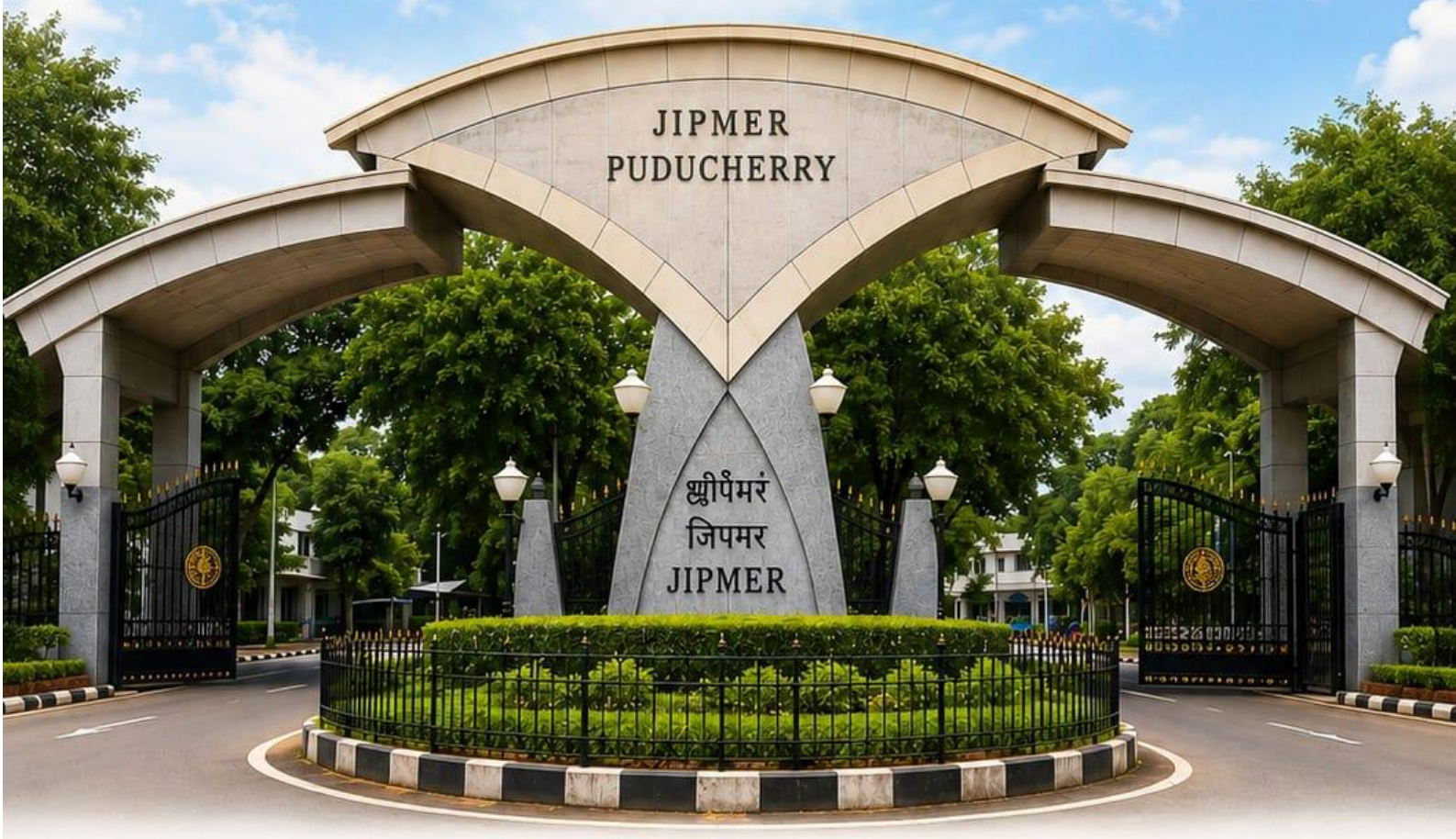
CURRICULUM

POSTGRADUATE

MD Pathology

From July 2026 session



JAWAHARLAL INSTITUTE OF POSTGRADUATE MEDICAL EDUCATION AND RESEARCH (JIPMER),
PUDUCHERRY – 605 006.

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This curriculum was approved at the 19th meeting of the Standing Academic Committee held on 28th January 2026 and ratified at the 22nd meeting of the Governing Body and will be applicable for students joining MD Pathology from the July 2026 session.

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GOAL OF THE COURSE

To produce a specialist who is competent to meet the following needs in the society,

1. Diagnosis related to Surgical Pathology, Cytopathology, Hematology and to some extent Blood Banking and Laboratory Medicine

   He would be able to offer high quality diagnostic opinion in a given clinical situation from an appropriate sample of tissue, blood, body fluids etc. to aid management of the patient. He will possess interpretive skills at both macroscopic and microscopic levels such that clinically useful opinions can be produced from surgical biopsy and cytology specimens and from the findings of post-mortem examinations.

2. Teach undergraduates and junior postgraduates the essentials of pathology

   Pathology forms the basis of understanding, diagnosis and hence the treatment of diseases. It is therefore an integral part of the training and curriculum of various undergraduate and postgraduate courses of medicine and allied branches. The course should attempt to bring out the talent of teaching in these candidates so that, when given the opportunity, such candidates can join academic institutions to fill the dearth of inspirational teachers in institutions.

3. Competent in the basics of scientific research.

   The training should include means by which a student can pursue research either independently or in a team. This facet is essential to the overall practice of Pathology.

TERMINOLOGY

Key-capabilities

- They refer to the practices carried out by the specialists as part of their professional services.
- They represent the services required from them, by patients, students, other medical/paramedical staff or the society in general.
- Thus, they refer to the specific tasks that the postgraduate will be expected to do after he completes the course.
- For the purpose of training, the tasks are broken down into units that have distinct cognitive concepts, unless they are predominantly procedural, or attitude based.

Core ideas in practice of Key-capabilities

They refer to the ideas that underly the practice of the specialists. They include ideas and concepts about structure and functioning of organs and organ systems in health and diseases, classification of diseases, equipment, tests, drugs etc.

COURSE CONTENT:

1. Key-capabilities (outline below, details in Annexure 1(Part A)
2. Core ideas in the practice of key-capabilities (outline below, details in Annexure 1(Part B)

KEY CAPABILITIES	
1	Procedures in Pathology and reporting
2	Management of laboratory equipment and lab safety
3	Quality control and regulatory guidelines
4	Research and Scholarship
5	Patient emergencies
6	Teaching
Learning objectives for key-capabilities in practice of Pathology	
Objectives divided as per cognitive, skill and affective domain in learning	

CORE IDEAS IN THE PRACTICE OF KEY-CAPABILITIES	
1	Surgical pathology
2	Autopsy pathology
3	Cytopathology
4	Haematology
5	Laboratory Medicine (Clinical Biochemistry/Clinical Pathology/ Basic Immunopathology).
6	Transfusion Medicine (Blood-Banking)
7	Basic sciences in relation to pathology: Immunopathology - immunofluorescence
8	Basic sciences in relation to pathology: Immunohistochemistry
9	Basic sciences in relation to pathology: Electron microscopy
10	Basic sciences in relation to pathology: Enzyme Histochemistry
11	Basic sciences in relation to pathology: Molecular Biology
12	Basic sciences in relation to pathology: Cytogenetics and FISH
13	Basic sciences in relation to pathology: Whole slide imaging and Artificial intelligence in Pathology
14	Basic sciences in relation to pathology: Quality control in different sections
15	Basic sciences in relation to pathology: Good clinical lab practices and Laboratory safety
16	Basic sciences in relation to pathology: Biomedical Waste management
17	Basic sciences in relation to pathology: Principles of Medical Statistics

LEARNING RESOURCES

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

- Acta Cytologica
- The American Journal of Pathology
- The American Journal of Surgical Pathology
- The American Journal of Hematology
- The American Journal of Clinical Pathology
- Archives of Pathology and Laboratory Medicine
- British Journal of Haematology
- Blood
- Diagnostic Cytopathology
- Histopathology
- Human Pathology
- Indian Journal of Cytology
- Indian Journal of Pathology and Microbiology
- Indian Journal of Hematology and Blood Transfusion
- Journal of Pathology
- Journal of Clinical Pathology
- Laboratory Investigation
- Modern Pathology
- Pathology
- Seminars in Hematology
- Seminars in Diagnostic Pathology
- Virchows Archives
- Yearbook Series
- 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, Gynaecology, 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

Histology for Pathologists. Stephen S. Sternberg (Ed), Raven Press, New York.
General Pathology JB Walter, MS Israel. Churchill Livingstone, Edinburgh
Robbin's Pathologic Basis of Disease Ramzi S.Cotran, Vinay Kumar, Stanley L Robbins WB Saunders Co., Philadelphia.
Pathology Emanuel Rubin, John L Farber. JB Lippincott Co., Philadelphia
Anderson's Pathology. John M Kissane (Ed). The CV Mosby Co., St. Louis
Ackerman's Surgical Pathology. Juan Rosai Mosby. St. Louis
Diagnostic Surgical Pathology. Stephen S Sternberg. Lippincott, William Wilkins. Philadelphia
Systemic Pathology. W St. C Symmers (Series Ed) Churchill Livingstone, Edinburgh
Diagnostic Histopthology of Tumours. Christopher DM Fletcher (Ed). Churchill Livingstone. Edinburgh.
Soft Tissue Tumors. Franz M Enzinger, Sharon W Weiss. Mosby, St. Louis
Cardiovascular Pathology Malcolm D Silver Churchill Livingstone New York.
Pathology of Pulmonary Diseases Mario J Saldhana. JB Lippincott Co., Philadelphia
Spencer's Pathology of the Lung. PS Hasleton. Mc Graw-Hill, New York.
Dahlin's Bone Tumors. K Krishnan Unni. Lippincott-Raven Publishers, Philadelphia, New York
Bone Tumours Andrew G Huvos WB Saunders Co. Philadelphia • Greenfield's Neuropathology. J Hume Adams (Ed) Edward Arnold, London.
Russell & Rubeinstein's Pathology of the Tumours of the Nervous System. Darrell D Bigna. Roger E Mc Lendon, Janet M Bruner (Eds.), Arnold, London
Rosen's Breast Pathology. Paul Peter Rosen. Lippincott-Raven Publishers, Philadelphia, New York.
Pathology of the Gastrointestinal Tract. S-I Chun Ming. Harvey Goldman (Eds.) Williams & Wilkins, Baltimore.
Haynes and Taylor Obstetrical & Gynaecological Pathology. H Fox, M Wells. Churchill Livingstone New York.
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.
Potter's Pathology of the Fetus & Infant. Enid Gilbert-Barnes (Ed). Mosby, St. Louis
Lever's Histopathology of the Skin, David Elder (Ed), Lippincott-Raven Publishers, Philadelphia, New York
Theory and Practice of Histological Techniques, Bancroft JD, Stevens A, Turner DR, Churchill Livingstone, Edinburgh

Histotechnology – A Self Instructional Text, Carson FL, American Society of Clinical Pathologists, Chicago
Histochemistry Theoretical and Applied. AG Everson Pearse. Churchill Livingstone, Edinburgh
Manual & Atlas of Fine Needle Aspiration Cytology. Svante R Orell, et al London
Cytopathology. Zuher M Naib. Little Brown and Company, Boston.
Diagnostic Cytology and its Histopathologic Basis, Koss LG, J.B. Lippincott, Philadelphia
Comprehensive Cytopathology, Bibbo M, W.B. Saunders Co., Philadelphia
William's Hematology Beutler E, Lichtmann MA, Coller BS, Kipps TJ, McGraw Hill, New York
Postgraduate Hematology Hoffbrand AV, Lewis SM, Tuddenham EGD, Butterworth Heinemann, Oxford
Wintrobe's Clinical Hematology, Lee GR, Foerster J, Lupeus J, Paraskevas F, Gveer JP, Rodgers GN, Williams & Wilkins, Baltimore
Practical Haematology, Dacie JV, Lewis SM, Churchill Livingstone, Edinburgh
Bone Marrow Pathology, Bain BJ, Clark DM, Lampert IA, Blackwell Science, Oxford
WHO classification series of various neoplasm

The list of books is incomplete. The students are encouraged to read literature as available, even books like Harrison's principles of medicine are treasure house of pathology knowledge. The students are also encouraged to use the world wide web for good sites related to Pathology eg pathology outlines, webpathology, dnbpathology as well as social media sites for forming groups for discussions related to pathology resources.

EDUCATIONAL STRATEGY

Diagnostic pathology is concerned with the application of knowledge of the human body and its diseases, and that of the investigative procedures in the recognition and quantitation of disease. In the training of a pathologist, acquisition of both these disciplines is essential. Eventually, the primary role of the pathologist is to apply the basic understanding of the disease processes to patient care, with the intellectual rigor and careful delineation of problems, characteristic of a research investigator. 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 diagnostic service. As mentioned earlier the emphasis is recommended under a residency programme or learning while serving/working. The following is a rough guideline to various teaching/learning activities that may be employed.

7.1. Collection of specimens including blood and bone marrow, fine needle aspiration of superficial lumps etc.
7.2. Grossing of specimens.
7.3. Performing autopsies.
7.4. Discussions during routine activities such as during signing out of cases.
7.5. Presentation and work-up of cases including the identification of special stains and ancillary procedures needed.
7.6. Clinico-pathological conferences.
7.7. Intradepartmental and interdepartmental conferences related to case discussions.
7.8. Conferences, Seminars, Continuing Medical Education (CME) programmes.
7.9. Journal Club.
7.10. Research Presentation and review of research work.
7.11. Guest and in-house lectures.
7.12. Participation in workshops, conferences, and presentation of papers at regional or national conferences etc.
7.13. Laboratory-work, including posting in emergency laboratory duties.
7.14. Webinars and other online teaching programmes.
7.15. Use and maintenance of equipment.
7.16. Quality control and biosafety issues
7.17. Maintenance of records.
7.18. Teaching undergraduates and paramedical staff.

Teaching learning methods:

a) Slide conference – Unknown slides are given and the diagnostic acumen of the students tested.
b) Gross conference – Grossing skills, with capacity to describe and interpret the gross findings are tested as well as the capacity to logically give bits of sections for microscopic study in order to arrive at a complete diagnosis are tested. Dissection of autopsy specimens is also discussed.
c) Techniques – Direct observation of technical skills like smear making, staining, performing tests like FNAC, ESR, urinalysis, handling machines etc are evaluated. Routine day to day techniques are encouraged to be discussed bench side in groups during routine posting. Advanced techniques would be discussed in common forum discussion.
d) Short topics and seminars – At least one or two presentations every term on relevant topics is assessed vide a preformed checklist.
e) Journal Clubs – The ability to critique an article published is assessed in journal clubs – One or two every term.
f) Interesting case presentations.
g) Quiz, Debates, clinico-pathological conferences etc.

The schedule of currently followed TL activities in the department on a regular basis is as follows:

Day	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Not fixed**
Time	9-10 am	9-10 am	Flexible	9-10 am	9-10 am	8-9 am	Not fixed
TL activity	**Slide conference**	**Short topic**	Flexible	**Common forum**	**Journal Club**	**Gross conference**	**Institute CPC**
Involvement	Residents and faculty		Flexible as per the activity	Residents, faculty, MSc MLT students, PhD scholars		Residents and faculty	
Scope	A set of slides for diagnosis/test are given prior and discussed by faculty either on multi-headed teaching microscope or with slide photographs or ppt as per the discretion of the faculty.	Seminar involving ppt presentation by the resident on topics covering various aspects of the course curriculum & recent advances.	To discuss common techniques in the section of posting. Adjustment of any academics which is postponed	Technique discussion especially advanced techniques Interim Thesis presentation Interesting case/ conference updates/ presentation	Two journals are presented by all involved as per a schedule prepared at the start of a 6-month term	A set of gross specimens (may be organ wise) or intact organs (autopsy) are discussed for gross findings, grossing and bit taking or organ cutting.	An interesting case, either autopsy or multiple organ biopsies is discussed in a forum involving multiple departments (Clinical, radiology, others)

Junior Residents are also encouraged to participate in the interdepartmental meets during their posting although it is primarily handled by senior residents and institute mortality meetings.

Postings within the department (in months)

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 method by which this is done may vary from institution to institution. However, it is suggested that one senior member of the faculty be given the chief responsibility for organizing and coordinating this programme and any enquiries may be made or assistance taken, if necessary, from him/her. The three-year training programme for the M.D. degree maybe arranged in the form of postings to different sections/laboratories for specified periods as outlined below. The period of such assignments/postings is recommended for 35months, leaving the final month for the purpose of examination. Posting schedules may be modified depending on needs, feasibility and exigencies. It is appreciated that individual institutions may find it convenient to follow a different pattern of posting.

Section/Subject	Duration in months
i) Surgical Pathology including techniques, IHC, IF and subspecialty postings	13
ii) Haematology & Clinical Pathology	11
iii) Cytopathology	10
iv) Transfusion Medicine/Blood Bank	1
v) Elective/Immunopathology/ Autopsy	1
TOTAL	**36**

What has been provided above is tentative guideline. Duration of each posting may vary depending on the resources available and the needs of each institute. During postings every effort must be made to ensure adequate exposure to all the techniques like flow cytometry, IHC etc and subspecialties like nephropathology, neuropathology, lymph node and hematopathology etc. Extramural postings 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.

A tentative posting schedule is given herewith to cover all sections in the total duration of the course.

Schedule	**1st 6 months** *	**7-12 months**	**13-18 months**	**19-24 months**	**25-30 months**	**31-33 months**	**34-36 months**	**Total**
Duration	**6 m**	**6 m**	**6 m**	**6 m**	**6 m**	**3 m**	**3 m**	**36 m**
Histopathology	2	2	2	2	3	1	1	13
Hematology + Clinical Pathology	2	2	2	2	1	1	1	11
Cytology	2	2	2	1	1	1	1	10
Blood Bank					1			1
Elective/ Autopsy Immunopathology/				1				1

* Proportionally reduce from each section if joins late; can be adjusted at end of 36 months for the batch if tenure is extended
NB: End posting examinations may be held beyond the 1st 6 months of orientation and till 30 months. It may be held together at the end of the 6-month period or after the end of respective posting period (~3-4 times for each section in total).

Dissertation

- A research project should be undertaken and dissertation must be submitted as per Postgraduate Research Monitoring Committee (PGRMC) guidelines of JIPMER.
- Two hard copies of the dissertation, prepared from the research project, should be submitted to the Dean (Academics) JIPMER, at two and half years of the course to become eligible to appear for the final examination at the end of the course, as per the guidelines of JIPMER.
- Six monthly interim presentations of the dissertations will be done to monitor the progress of the research work and take corrective measures when faced with difficulties.
- **Please refer to Postgraduate Dissertation Regulations and Postgraduate Examination Regulations document for further details**

Workplace observation

Logbook

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.

Workplace observation scheme

(Please refer Annexure 3 for sample forms)

Formative assessment should 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. A formal assessment can be recorded at the end of every posting and reviewed periodically which will be used as Internal Assessment marks.

1) Workplace based formative assessments can be done in the department periodically in the form of Direct Observation of Procedural Skills, Case Based discussion, 360-degree evaluation etc

2) 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:

(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

End of posting assessments to record the training and acquisition of technical and diagnostic skills should be done. In addition, they may be assessed with regard to

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

ASSESSMENT

Marks

Exam	Marks	Description
Theory exit examination	400 marks	This is the written exam at the end of the course. Four theory examination papers as given in the curriculum document of the course.
Practical exit exam	400 marks	This is the practical examination at the end of the course. The detailed scheme is given in the curriculum document of the course.
Internal Assessment	Internal assessment Theory: 50 marks	Two exams should be conducted - one at the end of first year and the other at the end of second year. Portions for the examination and pattern of the examination must be notified to the students at least one month in advance. The pattern of the internal assessment test will be similar to one paper of the theory exit examination. Two faculty members will evaluate the paper of each candidate in a blinded manner and the average of the 2 scores will be taken as the final score for the internal assessment. If a resident misses one of the tests due to medical reasons (medical certificate from a faculty member of the treating department and duly forwarded by the HoD to the Dean (Academic)), he/she can be permitted to appear in the test that is held for the next batch 6 months later. This can be permitted only once in the course period. If a resident does not attend an internal assessment test, or if he/she fails to attend the rescheduled test due to medical reasons, the score will be considered as 0 for the test. No retests or re-evaluation will be permitted under any circumstances.

		The internal assessment marks should be communicated to the students within two months of conducting the exams. Internal assessment test marks will be added to the final aggregate to the tune of 100 marks (theory and practical). There is no cut off of internal assessment test scores for determining eligibility to appear in the exit examination or to decide pass/fail solely based on the internal assessment test scores. However, when a student secures less than 50% marks in the internal assessment or when any concern is formally raised by the student with the Dean office, a review board with at least 3 faculty members should be constituted to review the student's performance with the student, recommend appropriate remedial measures, document the remedial plan, and submit a signed copy of the document to the Dean's Office. Additional periodic assessments can be held as part of formative assessment. Scores of these tests will not be considered for internal assessment and will not be considered for replacing scores of any of the internal assessment tests. Information to be provided to the Dean Office, before the final examination. 1. Dates of internal assessment examinations conducted 2. Names of faculty members involved in assessment against each date 3. Marks obtained by students in theory, practical and workplace-based observation in each exam session 4. Internal assessment marks for each student for Theory, Practical and Workplace based assessment. An average of the two theory and practical tests will be used to calculate scores for 50 and 25 marks respectively. Cumulative workplace-based assessment scores will be determined for 25 marks. 5. Copy of review documentations for periods of low performance of a student, if any, with remedial measures suggested by the departmental committee.
Internal Assessment	Internal assessment	For practical examinations, all members of the faculty of the department, from Assistant Professor

(Practical and Workplace-based assessment)	Practical: 25 marks Internal assessment Workplace-based assessment: 25 marks	to the senior-most faculty, shall participate in internal assessment on a rotating basis. The assessment shall be planned such that multiple faculty members are engaged for each student and different faculty members are engaged for the two assessments, wherever feasible. The pattern prescribed in the curriculum document shall be followed for practical assessments and the score shall be adjusted for 25 marks. Workplace-based assessment marks are given based on practice of the profession and affective domain attributes in the workplace and in the learning environment. Workplace observation proforma should be provided to students at the time of joining the department. The method of workplace observation should be explained to the students at the beginning of the course.
Dissertation	100 marks	Dissertation marks will be calculated by the average of the scores provided by 2 external examiners. Approval of the dissertation with more than 50% scores awarded by the external examiners will be one of the eligibility criteria for appearing for the exit examination of the discipline.
Total	1000 marks	**Criteria for PASS:** 1. (a) A candidate will need to pass the final Theory Exit Exam and Practical Exit Exam independently. (b) A minimum of 50% marks in 'Theory Exit exam' (a minimum of 40% in each of the four papers) and 50% in 'Practical Exit exam' separately shall be mandatory 2. A candidate should also score 50% or above in the final aggregate marks (500 out of 1000) to pass in the degree course. If a student secures a pass score in theory and practical examination but fails in the aggregate score, he/she can re-appear in the exit examination of the subsequent session. There is no provision to improve internal assessment or dissertation scores.
Please refer to Postgraduate Examination Regulations document for further details		

Syllabus for Exams

The Internal Examination syllabus may be subject to revision based on academic requirements.

Syllabus for the Internal Assessment:

The topics and schedule for MD Pathology Theory Internal Assessment are given in the following table. It is usually held on the last Saturday of the said month. The topics mentioned are supposed to be repeated every 2 years so that a JR in his/her tenure gets exposed to all important areas of theory. This theory internal assessment may be either given like a test or an assignment.

MD Pathology – Sample Internal Assessment Framework		
S. No	**Month/Year**	**Topics**
1.	Feb 2026	General Pathology + Immunopathology
2.	Jun 2026	Systemic Pathology (Part 1) ● GIT ● Hepatobiliary ● Pancreas ● CVS ● RS + Cytopath (Part 1) ● Exfoliative cytology
3.	Oct 2026	Hematology (Part 1) ● Disorders of RBC & WBC + Clinical Pathology
4.	Feb 2027	Systemic Pathology (Part 2) ● CNS/ Nerve & Muscle ● Bone & joints ● Soft tissue ● Endocrine system ● Breast + Cytopath (Part 2) ● Aspiration Cytology
5.	Jun 2027	Hematology (Part 2) ● Disorders of platelets ● Coagulation disorders ● Lymphoreticular system + Applied Pathology & blood bank
6.	Oct 2027	Systematic Pathology (Part 3) ● FGT ● MGT ● Kidney ● Urinary bladder ● Skin + Applied Pathology Cytopath (Part 3) ● Cervical cytology

The topics mentioned above will repeat every 2 years.

Theory Exit Exam

The examination for M.D. will be held at the end of 3rd academic year.

Paper I: General Pathology and Pathophysiology, Immunopathology

Paper II: Systemic Pathology & Cytopathology

Paper III: Haematology, Transfusion Medicine (Blood Banking) and Laboratory Medicine

Paper IV: Recent advances & Applied aspects.

Practical Exit Exam

Practical Examination should be conducted over a minimum period of two days and a maximum of three days.

Refer to **Blueprint in Annexure 3** for the blueprint of practical assessment that is currently being followed (2 and ½ days) and proposed condensed 2 days exam pattern.

The following is a guideline of the aspects to be covered.

1. Clinical Pathology: A. Discussion of a clinical case history, plan relevant investigations of the above case. One relevant investigation should be performed/result interpreted. B. Urine analysis

2. Histopathology: A. Examine, report, and discuss twelve to fifteen histopathology cases given the relevant history and slides. B. Perform a Haematoxylin and Eosin stain and any special stain on a paraffin section. C. Identify microtomy artefacts.

1. Autopsy: Given a case history in an autopsy case, and relevant organs (with or without slides) give a list of anatomical diagnosis and final autopsy diagnosis with reasoning regarding cause of death.

2. Gross Pathology: Describe findings of 8 to10 gross specimens and give anatomical diagnosis and identify the sections to be processed.

3. Cytopathology: A. Examine, report and discuss seven to ten cytology cases (FNAC, fluids, cervical smear) given the relevant history and slides. B. Perform FNAC and C. Perform PAP stain.

4. Haematology: A. Examine, report and discuss eight to ten cases given the history and relevant blood smears and /or bone marrow aspirate/ trephine biopsy smears. B. Discuss haematology case given the relevant history, plan relevant investigations, perform at least two tests: one routine and one special exercise.

5. Transfusion Medicine: Perform the necessary exercise given a relevant history (blood grouping/ Coombs test).

6. Basic Sciences: In the form of spotters, OSPE - Identify electron microphotographs, gels, results of PCR, immunological tests including staining for direct/indirect immunofluorescence, histochemical and immunohistochemistry stains, electrophoresis strips, osmotic fragility chart, flow cytometry plots, platelet aggregation graphs etc.

Viva-voce 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. This should include questions on quality assurance, recent advances and techniques and lab management. Also, questions on the thesis/dissertation may be asked at this time.

MODEL THEORY QUESTION PAPERS

M.D. DEGREE EXAMINATIONS

PATHOLOGY

Paper I

General Pathology, Pathophysiology and Immunopathology

Time: Three Hours Maximum Marks: 100

Answer ALL Questions

1. What are free radicals? How are they metabolized? What are the utilities & pathological effects of free radicals? (1+4+5)
2. Elaborate on the contrasting role of chronic inflammation in: (5+5)
    a) Promotion/ progression and control of tumour.
    b) Spectrum of inflammatory response to infection.
3. Describe the alternate complement pathway. Explain the clinicopathological features and laboratory workup of C3 glomerulopathy. (4+6)
4. Write a brief note on: (5+5)
    a) Pathophysiology and clinical features of fat embolism syndrome
    b) Mechanism of DIC in obstetric setting.
5. Discuss the concept of genomic imprinting. Describe two examples of common heritable diseases associated with genomic imprinting. (4+6)
6. Write short notes on: (5+5)
    a) Innate immunodeficiency
    b) Various modalities available for the diagnosis and categorization of amyloidosis.
7. Discuss role of Mismatch repair (MMR) genes in colorectal cancers and methods to diagnose the defects in MMR genes. (5+5)
8. Classify Leprosy. Describe the immunopathology of Leprosy in detail. (3+7)
9. You are asked to do a perinatal autopsy on a 36-week foetus with hydrops. Discuss the aetiology and pathogenesis of foetal hydrops. Write a note on the approach to the autopsy of a foetal hydrops. (5+5)
10. What are the cell cycle check points? Elaborate on the role of cell cycle check point components in various neoplastic processes. (2+8)

The question paper may be formed in such a way so as to elicit precise information. The questions should be less open ended and strive to evaluate the approach to a disease entity, recent concepts, and not mere theoretical rote knowledge.

M.D. DEGREE EXAMINATIONS

PATHOLOGY

Paper II

Systemic Pathology including Cytopathology

Time: Three Hours Maximum Marks: 100

Answer ALL Questions

1.	A 17-year old young female was diagnosed with a mediastinal mass and a biopsy was done. What would be the approach to the biopsy on histo-morphology as well as IHC?	(10)
2.	Discuss on the cytological features to differentiate adenocarcinoma and squamous cell carcinoma in cervical smears (Conventional & LBC).	(10)
3.	Discuss the approach to muscle biopsy to differentiate neurogenic versus myopathic diseases. Ass a note on the technical aspects regarding processing and staining of muscle biopsy.	(5+5)
4.	Discuss the pathogenesis, duodenal biopsy findings and serological markers of celiac disease. Add a note on malignancies associated with it.	(6+4)
5.	Discuss the principle and role of immunofluorescence in dermatopathology.	(10)
6.	Discuss the cytological approach to a necrotic aspirate from a lymph node swelling.	(10)
7.	Describe the cytology of the solid pseudopapillary neoplasm of the pancreas along with the immunocytochemistry and differential diagnosis.	(10)
8.	Elaborate on the pathogenetic role of Epstein-Barr virus (EBV) in various solid tumours and the diagnostic modalities for establishing the same.	(10)
9.	Describe the differential diagnosis and pathology of Clear cell rich lesions of salivary gland.	(10)
10.	Discuss the principle and practice of safe disposal of biomedical waste in histopathology laboratory including grossing station.	(10)

The question paper may be formed in such a way so as to elicit precise information. The questions should be less open ended and strive to evaluate the approach to a disease entity, recent concepts, and not mere theoretical rote knowledge.

M.D. DEGREE EXAMINATIONS

PATHOLOGY

Paper III

Haematology, Transfusion Medicine (Blood Banking) and Laboratory Medicine

Time: Three Hours Maximum Marks: 100

Answer ALL Questions

1. What are the principles of Automated Cell Counter? Describe flags and trouble shooting in cell counters. How can we best use the extended RBC and platelet parameters provided in a haematology analyser? (3+4+4)
2. A 34-year old lady has a history of passing dark cola coloured urine during early morning as well as signs of anaemia. Later she developed a sudden catastrophic event characterized by jaundice, abdominal pain, hepatomegaly and ascites. How will you evaluate this case in terms of pathophysiological features and correlate it with haematological, biochemical and flow cytometry studies. (10)
3. Write a brief note comparing and contrasting (5+5)
    a) Fibrin degradation products & D-DIMER
    b) Ferritin & hemosiderin
4. Elaborate on the current concepts in nomenclature, diagnosis and prognosis of myelodysplastic neoplasms. (10)
5. Discuss the utility of flow cytometry in the diagnosis of lymphoproliferative neoplasms. (10)
6. Enumerate the risk factors for development of inhibitory antibodies in Haemophilia A and describe the approach to complete laboratory diagnosis. (10)
7. Discuss the role of megakaryocyte morphology, morphometry and topography in myeloproliferative neoplasms. (10)
8. What are the different types of apheresis? How are they therapeutically used in various hematologic disorders? (10)
9. A 46-year-old male with blurring of vision, generalized lymphadenopathy and hepatosplenomegaly was found to have marked rouleaux formation and circulating lymphoplasmacytoid cells on his blood film (6+4)
    a) Outline your investigational approach to this patient.
    b) What are the clinical and laboratory indicators for prognosis?
10. Enumerate blood components in Transfusion practice and write about procedures for their preparation, storage, lifespan and uses. (10)

The question paper may be formed in such a way so as to elicit precise information. The questions should be less open ended and strive to evaluate the approach to a disease entity, recent concepts, and not mere theoretical rote knowledge.

M.D. DEGREE EXAMINATIONS

PATHOLOGY

Paper IV

Recent Advances and Applied Aspects

Time: Three Hours Maximum Marks: 100

Answer ALL Questions

1. Discuss the pathogenetic role PD1 – PDL1 interaction with respect to cancer immunotherapy in various malignancies. (10)
2. What are the recent updates in the molecular classification of medulloblastomas? (10)
3. Elaborate on the recommendations of international system for reporting serous fluid cytopathology. (10)
4. Discuss about liquid biopsy and its clinical applications in solid neoplasia. (10)
5. Discuss the clinical features, pathogenesis and recommendations for laboratory diagnosis of Anti Phospholipid syndrome. (10)
6. Discuss the approach with the newer site specific immunohistochemical markers for diagnosis of carcinoma of unknown origin. (10)
7. Discuss about next generation sequencing and its applications in diagnostic pathology. (10)
8. Write a short note on the current understanding and pathology of two relatively recently described tumours. (5+5)
   a) NUT midline carcinoma
   b) PEComa
9. Discuss the practical utility of fluorescence in situ hybridisation in the pathological diagnosis of soft tissue and bone tumours. (10)
10. Write short notes on: (5+5)
    a) SWI/SNF deficient tumours.
    b) DICERI tumour predisposition syndrome

The question paper may be formed in such a way so as to elicit precise information. The questions should be less open ended and strive to evaluate the approach to a disease entity, recent concepts, and not mere theoretical rote knowledge.

Annexure 1 (Part A)

KEY CAPABILITIES	
1	Procedures in Pathology and reporting
2	Management of laboratory equipment and lab safety
3	Quality control and regulatory guidelines
4	Research and Scholarship
5	Patient emergencies
6	Teaching
Learning objectives for key-capabilities in practice of Pathology	
Objectives divided as per cognitive, skill and affective domain in learning	

Levels of performance: 1-knows; 2-can do with strict supervision; 3- can do with loose supervision; 4-can do independently; 5-can teach

S.no	Key capabilities	Minimum expected level of performance at time-points					
		6m	1 y	1.5 y	2 y	2.5y	3y
	Procedures in Pathology and reporting						
	Interpret clinical and laboratory data provided in the requisition forms with reasonable accuracy and arrive at a probable diagnosis	1		2	3	4	5
	Correlate clinical and pathological data to explain various clinical signs, symptoms, and manifestations of diseases	1		2	3	4	5
	Diagnose routine and complex clinical problems based on surgical pathology and cytopathology specimens, blood and bone marrow examination and various other tests under the domain of clinical pathology, blood bank and transfusion medicine	1		2	3	4	5
	Advice on the nature of the tests and appropriate specimens necessary to arrive at a diagnosis.	1		2	3	4	5
	Able to correlate clinical and laboratory findings with pathology findings in autopsy, identify correlations and cause of death due to diseases.	1		2	3	4	5
	Able to write succinct and lucid reports including advice on their content and composition. Should have the ability to write a synoptic report, wherever needed, following protocols and international standards.	1		2	3	4	4
	Able to perform most of the routine tests in a Pathology laboratory including grossing of specimens, processing and cutting of paraffin sections, making smears, frozen sections and staining.	1		2	3	4	5
	Able to collect specimens by procedures such as venepuncture, finger prick, fine needle aspiration biopsies of superficial lumps and bone marrow aspirates.	1	2	3	4	5	
	Perform an autopsy, dissect various organs and interpret gross findings.	1		2	3	4	5
	Able to function as a part of a team that is essential for the diagnosis and management of a patient.			1		2	3
	Should, whenever necessary, interact with patient and clinicians and colleagues to provide the best possible diagnosis.	1		2	3	4	5

	Develop communication skills not only to word reports and professional opinions but also to interact with patients, relatives, peers and paramedical staff.	1	2	3	4		5
	Always adopt ethical principles and maintain proper etiquette in his/her dealings with patients, relatives and other health personnel.	1			2	3	4
	Management of laboratory equipment and lab safety						
	Should have a basic understanding of the principles of working of routine laboratory equipment used in surgical pathology, haematology, cytopathology clinical pathology and Transfusion Medicine	1		2	3	4	
	Should be familiar handling and maintenance of laboratory equipment.	1		2	3	4	5
	Able to identify technical problems in laboratory and offer useful solutions so as to maintain quality in laboratories.				1	2	3
	Should be aware of the various chemical/ reagents used and their storage specifications with regard to laboratory safety	1			2	3	4
	Able to effectively dispose of laboratory waste to ensure minimal risk of infections and accidents in laboratories.	1		4			
	Quality control and regulatory guidelines						
	Should possess a basic understanding of the importance of quality control			1			
	Should be familiar with the various quality control measures taken in different sections of pathology laboratory				1		
	Should be familiar with quality assurance programs conducted national and international agencies and their guidelines				1		
	Research and Scholarship						
	Dissertation writing					3	
	Able to systematically write a scientific paper and publish in journals			2		3	
	Able to present a paper at scientific conferences either through an oral or poster presentation			2		3	
	Able to present a Journal and analyse its strengths and limitations	2		3			4
	Patient emergencies						
	Management of complications arising during procedures like venepuncture, FNAC and bone marrow aspiration/biopsy	1	3	4	5		

	Teaching						
	Able to teach Pathology to undergraduates, postgraduates, laboratory personnel, nurses and other paramedical staff	2		3	4	5	
	Able to demonstrate and teach routine and basic procedures to undergraduates, postgraduates, laboratory personnel, nurses and other paramedical staff			2	3	4	

OBJECTIVES FOR KEY-CAPABILITIES

Generic Objectives for Procedures in Pathology and reporting:

1) Interpret clinical and laboratory data provided in the requisition forms with reasonable accuracy and arrive at a probable diagnosis
2) Correlate clinical and pathological data in order to explain various clinical signs, symptoms and manifestations of diseases
3) Diagnose routine and complex clinical problems on the basis of surgical pathology and cytopathology specimens, blood and bone marrow examination and various other tests under the domain of clinical pathology, blood bank and transfusion medicine
4) Advice on the nature of the tests and appropriate specimens necessary to arrive at a diagnosis.
5) Able to correlate clinical and laboratory findings with pathology findings in autopsy, identify correlations and cause of death due to diseases
6) Able to write succinct and lucid reports including advice on their content and composition. Should have the ability to write a synoptic report, wherever needed, following protocols and international standards.
7) Able to perform most of the routine tests in a Pathology laboratory including grossing of specimens, processing and cutting of paraffin sections, making smears, frozen sections and staining.
8) Able to collect specimens by procedures such as venepuncture, finger prick, fine needle aspiration biopsies of superficial lumps and bone marrow aspirates.
9) Perform an autopsy, dissect various organs and interpret gross findings.
10) Able to function as a part of a team that is essential for the diagnosis and management of a patient.

Generic objectives for management of laboratory equipment and laboratory safety:

1) Should have a basic understanding of the principles of working of routine laboratory equipment used in surgical pathology, haematology, cytopathology clinical pathology and Transfusion Medicine
2) Should be familiar handling and maintenance of laboratory equipment.
3) Able to identify technical problems in laboratory and offer useful solutions so as to maintain quality in laboratories.
4) Should be aware of the various chemical/ reagents used and their storage specifications with regard to laboratory safety
5) Able to effectively dispose of laboratory waste to ensure minimal risk of infections and accidents in laboratories.

6) Should, whenever necessary, interact with patient and clinicians and colleagues to provide the best possible diagnosis.
7) Develop communication skills not only to word reports and professional opinions but also to interact with patients, relatives, peers and paramedical staff.

Generic objectives for Quality control and regulatory guidelines:

1) Should possess a basic understanding of the importance of quality control
2) Should be familiar with the various quality control measures taken in different sections of pathology laboratory
3) Should be familiar with quality assurance programs conducted national and international agencies and their guidelines

Generic objectives for Research and Scholarship:

1) Recognize a research problem–basic or applied
2) Clearly state the objectives in terms of what is expected to be achieved in the end.
3) Plan rational approaches with appropriate controls with full awareness of the statistical validity of the size of experimental material
4) Carry out most of the technical procedures required for the study.
5) Accurately and objectively record on systematic lines the results and observations made.
6) Analyse the data with the aid of an appropriate statistical analysis, if necessary.
7) 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.
8) Take photomicrographs, of a quality fit for publication in an international journal.
9) Write the thesis or a scientific paper in accordance with the prescribed instructions, as expected of international standards.

Generic objectives of patient emergencies:

1) Management of complications arising during procedures like venepuncture, FNAC and bone marrow aspiration/biopsy

Generic objectives of Teaching:

1) Able to teach Pathology to undergraduates, postgraduates, laboratory personnel, nurses and other paramedical staff.
2) Able to demonstrate and teach routine and basic procedures to undergraduates, postgraduates, laboratory personnel, nurses and other paramedical staff

OBJECTIVES AS PER DOMAIN OF LEARNING

Objectives in Cognitive Domain

1) Diagnose routine and complex clinical problems on the basis of surgical pathology and cytopathology specimens, blood and bone marrow examination and some other tests under the domain of clinical pathology and transfusion medicine.
2) Interpret clinical and laboratory data with reasonable accuracy and prepare a succinct and lucid report, follow standard protocols for reporting including synoptic reporting.

3) Interpret clinical and laboratory data with reasonable accuracy.
4) Correlate clinical and pathological data in order to explain various clinical signs, symptoms and manifestations of diseases.
5) Advice on the nature of the tests and appropriate specimens necessary to arrive at a diagnosis.
6) Able to perform pathological autopsies especially neonatal/ foetal and with assistance adult autopsies; should be able to correlate clinical and laboratory findings with pathology findings in autopsy, identify correlations and cause of death due to diseases.
7) Able to teach Pathology to undergraduates, postgraduates, laboratory personnel, nurses and other paramedical staff.
8) Carry out research.
9) Maintain accurate records of tests and their results for a reasonable period of time for retrieval and archival purposes.
10) Able to systematically write a scientific paper and publish in journals.
11) Able to present a paper at scientific conferences either through an oral or poster presentation.
12) Able to identify technical problems in laboratory and offer useful solutions to maintain quality in laboratories.
13) Able to effectively dispose of laboratory waste to ensure minimal risk of infections and accidents in laboratories.
14) Able to supervise and work with subordinates and colleagues.
15) Subject himself/herself to the habit of lifelong learning by building on previous undergraduate and general medical training experience by updating continuing education so that relevant knowledge of disease processes is acquired and maintained at a level consistent with the requirements of independent practice.

Objectives in Psychomotor domain

1) Able to perform most of the routine tests in a Pathology laboratory including grossing of specimens, processing and cutting of paraffin sections, making smears, frozen sections and staining.
2) Able to collect specimens by procedures such as venepuncture, finger prick, fine needle aspiration biopsies of superficial lumps and bone marrow aspirates. It is implied that the candidates be aware of the indications and possible complications following these procedures. Further, whenever necessary the candidates must be able to provide appropriate help to colleagues performing invasive procedures such as a biopsy or imaging guided aspirations.
3) Perform an autopsy, dissect various organs, and interpret gross findings.
4) Should be familiar with the function, handling, and maintenance of laboratory equipment.

Objectives in Affective domain

1) Should be able to function as a part of a team that is essential for the diagnosis and management of a patient. He/she should develop an attitude of cooperation necessary for this purpose.
2) Should, whenever necessary, interact with patients and clinicians and colleagues to provide the best possible diagnosis.
3) Always adopt ethical principles and maintain proper etiquette in his/her dealings with patients, relatives and other health personnel.
4) Respect the rights of patients including the right to information and second opinion.
5) Should seek and give a second opinion only when necessary. Provide leadership and inspire members of the team involved in the field of diagnostic pathology, teaching and research.
6) Develop communication skills not only to word reports and professional opinions but also to interact with patients, relatives, peers and paramedical staff

Annexure 1 (Part B)

CORE IDEAS IN THE PRACTICE OF KEY-CAPABILITIES	
1	Surgical pathology
2	Autopsy pathology
3	Cytopathology
4	Haematology
5	Laboratory Medicine (Clinical Biochemistry/Clinical Pathology/ Basic Immunopathology).
6	Transfusion Medicine (Blood-Banking)
7	Basic sciences in relation to pathology: Immunopathology - immunofluorescence
8	Basic sciences in relation to pathology: Immunohistochemistry
9	Basic sciences in relation to pathology: Electron microscopy
10	Basic sciences in relation to pathology: Enzyme Histochemistry
11	Basic sciences in relation to pathology: Molecular Biology
12	Basic sciences in relation to pathology: Cytogenetics and FISH
13	Basic sciences in relation to pathology: Whole slide imaging and Artificial intelligence in Pathology
14	Basic sciences in relation to pathology: Quality control in different sections
15	Basic sciences in relation to pathology: Good clinical lab practices and Laboratory safety
16	Basic sciences in relation to pathology: Biomedical Waste management
17	Basic sciences in relation to pathology: Principles of Medical Statistics

Overview

Unlike the undergraduate syllabus, it is difficult to give a precise outline of the course content for postgraduate training. 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/she is supposed to keep up to date with the latest developments in the field of pathology and related sciences.

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:

High degree of Professional competence

In the following fields, related to diagnosis of appropriate diseases, a high degree of professional competence and theoretical knowledge is expected.

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 a broad outline is provided and a compendium of chapters as available in standard textbooks is avoided here. The scope of pathology is vast and following is a guideline that in essence covers all aspects.

1. General Pathology:

Normal cell and tissue structure and function. The changes in cellular structure and function in diseases. Causes and pathogenesis of diseases/ reaction of tissue and organs to various lethal and sub lethal injury. Various aspects of inflammation, immunity and neoplasia

2. Systemic Pathology:

The study of normal structure and function of various organ systems and etiopathogenesis, gross and microscopic alterations of structure and function of these organ systems in diseases.

All organ systems are to be studied. This forms the basis of Surgical Pathology, Cytopathology, Autopsy Pathology and Clinico-pathological correlation.

3. Hematology

The study of haematology includes all aspects of diseases of blood and bone marrow. This involves the study of the normal structure and function and the causes of diseases and morphological changes thereof.

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 as in

1. Laboratory Medicine (Clinical Biochemistry/Clinical Pathology/ Basic Immunopathology).
2. Transfusion Medicine (Blood-Banking)

Some centres have separate degrees/diplomas/postgraduate courses for some of these subjects. However, current practice of Pathology, both institutional or otherwise demands a reasonable working knowledge of these broad areas.

Broad Acquaintance

The following are the fields in which the student is expected to acquire a general, but broad acquaintance of techniques and principles and competence to understand and interpret data without being called upon to achieve technologic proficiency.

1. Immunopathology - immunofluorescence
2. Immunohistochemistry
3. Histochemistry
4. Cytogenetics
5. Electron microscopy
6. Tissue culture
7. Medical statistics
8. Molecular Biology
9. Maintenance of records
10. Information retrieval, Computer, Internet in medicine.

It is expected that the level of proficiency that is to be expected may vary. Therefore, the level of competence in Immunopathology assumes importance in the interpretation of renal diseases. Similarly, the findings on Immunohistochemistry may be as important as the findings on light microscopy in a particular case.

Core ideas in the practice of pathology

A brief outline of what is expected to be learnt during each of the postings in the different sections/laboratories during the MD Course will be given under each head.

I. Surgical Pathology

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.

(1) Should be able to identify problems in the laboratory and offer viable solutions.
(2) Should be conversant with various equipment and instruments used in the Surgical Pathology laboratory.
(3) Should have knowledge of automation and quality assurance in various sections in Surgical Pathology.

Skills:

(1) 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.
(2) Training in the performance of the examination, description and macroscopic sampling of surgical and biopsy specimens (the grossing) so as to be able 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.
(3) 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 the classical lesions commonly encountered in the surgical pathology service without the aid of the clinical data.
(4) Be familiar with automatic tissue-processing machines and verbally demonstrate his understanding of the principles of its running.
(5) Be familiar with fixation of tissue, processing of tissue, making of paraffin blocks and cutting of sections on a rotary microtome.
(6) Select appropriate blocks to show lesions in relevant planes of section, including using protocols for minimum data sets where relevant.
(7) Handle different types of specimens appropriately according to the degree of clinical urgency.
(8) Stain paraffin sections with the following making use of available SOP:
    (a) Haematoxylin and eosin
    (b) Stains for collagen, elastic fibres and reticulin
    (c) Iron stain
    (d) PAS stain
    (e) Acid fast stain
    (f) Stains for mucin like Mucicarmine and Alcian Blue etc
(9) Demonstrate understanding of the principles of special stains and their utility.
(10) Should have reasonable knowledge of how to cut a frozen section of tissues received from the operating room for quick diagnosis, under technical supervision, stain and interpret the slide in correlation with the clinical data provided, and correctly diagnose within 15 minutes.
(11) Demonstrate the understanding of the utility of various immunohistochemical stains especially in the diagnosis of tumour subtypes.
(12) Practice in writing histopathology reports including advice on their content and composition. The reports should be succinct and lucid, with clinical notes and advice, as necessary. Should have the ability to write a synoptic report, wherever needed, following protocols and international standards.

II. Autopsy Pathology

Knowledge:

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

Skills:

It is well known that the rate of clinical autopsies has dwindled all over the world. A posting, therefore in Forensic Medicine Department for observation of medico-legal autopsies, is needed to complete the training with regards to autopsy pathology. An improvised autopsy may also be arranged in places where full autopsy is not possible. Relevant organs from wet specimens in the museum with appropriate clinical history may be arranged for a detailed description and diagnosis. At least ten such improvised autopsies may be discussed by each candidate.

1) 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. In case needed, relevant tissue bits may be subjected to histopathological examination.
2) Identify and correctly diagnose 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.
3) Write correctly and systematically provisional and final anatomic diagnosis reports (on gross & microscopy respectively), the major findings at autopsy, and give a complete autopsy diagnosis.

III. Cytopathology

Knowledge:

5.3.1.1 Should possess the background necessary for the evaluation and reporting of cytopathology specimens.

5.3.1.2 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. Method of obtaining various specimens (urine sample, bronchial lavage etc.)

Skills:

Demonstrate familiarity with the steps and be able to interpret simple immunological tests used in diagnosis of diseases and in research procedures, subject to the availability of facilities.

a) Immuno-electrophoresis and immunofixation
b) Immunofluorescence techniques especially on kidney and skin biopsies
c) Counter current electrophoresis for demonstration of antigen
d) Latex agglutination
e) Anti-nuclear Factor (ANF)
f) Anti-neutrophil cytoplasmic antibody (ANCA) etc

1) Immunohistochemistry

Knowledge:

1. Demonstrate familiarity with the principles and exact procedures of various immunohistochemical stains using appropriate systems, employing monoclonal and polyclonal antibodies.
2. Should be familiar with automation and newer advances in IHC techniques.
3. Knowledge of various advances in secondary detection systems and enzyme conjugates.

Skills:

1. Be able to perform immunohistochemical staining on paraffin section with at least one of the commonly used antibodies using appropriate system as available.
2. Should be conversant with the common IHC panels for diagnosis of various diseases/neoplasms.

2) Electron Microscopy

Knowledge:

1. Demonstrate familiarity with principles and techniques of electron microscopy and the working of an electron microscope (including Transmission and Scanning Electron microscopy: TEM and SEM)

1. Should be conversant with the technique of proper fixation, processing, cutting semithin and ultrathin sections and staining of tissues for electron microscopy.
2. Recognize the appearance of the normal subcellular organelles and their common abnormalities (when provided with appropriate photographs).

3) Enzyme Histochemistry

Knowledge:

Should be familiar with the principles, use and interpretation of common enzyme histochemical procedures e,g, for muscle biopsies and Hirschprung disease (Alkaline Phosphatase at pH 9.4 and 4.6, nicotinamide adenine dinucleotide hydrogen dehydrogenase, Acid Phosphatase, Succinyl Dehydrogenase, Acetyl Cholinesterase etc).

Skills:

Operate the cryostat and demonstrate familiarity with the principles of its working and be able to stain tissue sections for some cell constituents.

Demonstrate familiarity with the commonly used enzyme histochemical procedures.

4) Molecular Biology

Knowledge:

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

Skills:

Should be conversant with the steps of a Polymerase Chain Reaction (PCR) and its modifications like RT-PCR, Nested PCR etc. and should demonstrate understanding of the steps and principles of interpretation of Western Blot, Southern Blot, Hybridization procedures, Next Generation Sequencing.

5) Cytogenetics and FISH

Knowledge:

Should understand the principles and various methods of karyotyping, cytogenetics, in situ hybridization techniques including FISH. Should understand the utility as diagnostic tests in various diseases.

Skills:

Should be conversant with the steps of Karyotyping, cytogenetics and FISH and be able to identify common results in both karyotype and FISH.

6) Whole Slide Imaging and Artificial intelligence in Pathology:

Should demonstrate familiarity with the use of digital slide imaging, algorithms to evaluate findings in imaging, morphometry and application of artificial intelligence.

7) Quality Control in different sections:

Should have good working knowledge on the quality control in each laboratory and be aware and actively participate in the various quality control programmes running in the department, both internal and external. Interpretation of QC and proficiency testing results, implementation of corrective and preventive action based on QC and proficiency testing results. Should be familiar with inter and intra assay variations, batch variations, validation of chemicals and instruments, including identification of errors, either in the pre-analytical, analytical and post-analytical steps and take necessary steps to correct the same. Should have knowledge of the basics of quality assurance according to (NABL, NABH and ISO 15189) guidelines.

8) Good clinical lab practices and Laboratory Safety:

Candidates must have good working knowledge on the technology and principles of the equipment used in all sections of Pathology, including automated tissue processor, tissue embedding station, automated slide stainer and cover-slipper, whole slide scanner, cell counters, flow cytometers, coagulometers, LBC equipment, centrifuges, microtomes etc. Troubleshooting for error flags in the analytical system including calibration failure, reagent or QC or calibrator deterioration, temperature instability, water quality and other issues related to the equipment.

Should be aware of and demonstrate good lab practices and safety including universal precautions. Be aware of record maintenance of capital equipment and consumables. Be aware of purchase specifications, approximate costs of reagents and equipment, maintenance of store logbooks etc.

9) Biomedical Waste Management:

Should be aware of and demonstrate disposal methods for each specimen, reagents, instruments, autoclaving techniques, recycling of products and e-waste. Follow principles and guidelines of Hospital Infection Control measures.

10) Principles of Medical Statistics:

Knowledge:

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

Skills:

Calculate mean, standard deviation and standard error, sensitivity and specificity and other simple statistical methods from the given experimental date

Important Note

i) It is appreciated that the facilities in Institutions vary, and this is more likely in the case of Basic Sciences Training. 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 emphasized 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.

ii) 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 to it. The overall wellbeing of the sick is a team-effort. The student must learn that working, as a team is essential today.

iii) It should be the endeavour of every training programme to emphasize on quality control and on the limitations of each test.

Annexure 2

Consolidated list of Procedures

1. Clinical Pathology:

A. Discussion of clinical case history, plan relevant investigations.

Perform relevant investigation should be performed/result interpreted.

B. Urine analysis

2. Histopathology:

A. Examine, report, and discuss histopathology cases given the relevant history and slides.

B. Perform a Haematoxylin and Eosin stain and special stain on a paraffin section.

C. Identify microtomy artefacts.

3. Autopsy: Given a case history in an autopsy case, and relevant organs (with or without slides) give a list of anatomical diagnosis and final autopsy diagnosis with reasoning regarding cause of death.

4. Gross Pathology: Describe findings of gross specimens and give anatomical diagnosis and identify the sections to be processed.

5. Cytopathology:

A. Examine, report and discuss cytology cases (FNAC, fluids, cervical smear) given the relevant history and slides.

B. Perform FNAC and

C. Perform PAP stain.

6. Haematology:

A. Examine, report and discuss cases given the history and relevant blood smears and /or bone marrow aspirate/ trephine biopsy smears.

B. Discuss haematology case given the relevant history, plan relevant investigations, perform at least two tests: one routine and one special exercise.

7. Transfusion Medicine: Perform the necessary exercise given a relevant history (blood grouping/ Coombs test).

8. Basic Sciences:

In the form of spotters, OSPE - Identify electron microphotographs, gels, results of PCR, immunological tests including staining for direct/indirect immunofluorescence, histochemical and immunohistochemistry stains, electrophoresis strips, osmotic fragility chart, flow cytometry plots, platelet aggregation graphs etc.

Annexure 3

ASSESSMENT OF JOURNAL CLUB

Name of student I/II/III YR PG
Title of the Article
Citation details
Date of Presentation

Parameter Scored 1 to 4	Faculty 1	Faculty 2	Faculty 3	Faculty 4	Faculty 5	Faculty 6
Choice of Article and Relevance						
Cogency of Presentation						
Whether he/she understood the purpose						
Whether cross reference has been consulted and whether any other relevant information made from similar articles						
Overall impression of the strong points						
Weak points of the article with reason						
Use of AV aids						
Response to questioning						
Time schedule						
Overall impression						
COMMENTS IN WORDS						

Each parameter to be scored as 1 – Poor, 2 – Average, needs improvement 3 – Good 4 – Excellent
Note – At present we are maintaining a google form for assessment.

Faculty Name and Signature

ASSESSMENT OF SHORT TOPIC SEMINAR

Name of student I/II/III YR PG
Topic
Moderator -
Date of Presentation

Parameter Scored 1 to 4	Faculty 1	Faculty 2	Faculty 3	Faculty 4	Faculty 5	Faculty 6
Introduction to subject/historical perspective and importance						
Cogency of Presentation organisation and logical sequence						
Completeness of the topic						
Consulted relevant literature and recent updates including references						
Ability to answer questions						
Whether followed principles of presentation like set induction, objectives, audience participation, closure etc						
Use of AV aids – proper use of media, slide design, formatting, spellings etc						
Time schedule						
Overall impression						
COMMENTS IN WORDS						

Each parameter to be scored as 1 – Poor, 2 – Average, needs improvement 3 – Good 4 – Excellent

Note – At present we are maintaining a google form for assessment.

Faculty Name and Signature

Blueprints of Practical Exam (2 ½ and 2 days schedules)

Department of Pathology, JIPMER MD Practical examination

Date	Time	Exercise	Marks
Day 1	9.30 – 10.30 am	Autopsy and cut ups (one case with organs and one organ for cutting)	20
	10.30 – 11.10 am	Gross specimens (8x 5 marks)-Optional-One fresh surgical specimen for grossing and taking bits	40
	11.10 -11.40 am	FNAC procedure	10
	11.40 am – 1.00 pm	Discussion of 1, 2, 3	**(70)**
	1.00pm – 2.00pm	LUNCH	
	2.00-4.00 pm	Histopathology and cytology Techniques including discussion. (1. Microtomy/ Artefacts, 2. H and E staining, 3. Special Stain (ZN, PAS, Perls, VG)– 5 marks each (15 marks), 4. PAP staining of FNAC smear (10 marks)	**(25)**
	4.00 – 4.30 pm	Spotters (10x3 marks)- marks included in viva	
Day 2	8.30 am– 9.45 am	Haematology and cytology slides (8+7 slides= 15x5 marks) – the number could vary*	**75**
	9.50 am – 10.50 am	Haematology special case study and one special technique depending on the case (1. MPO/PAS/Perls 2. PT or APTT 3. Sickling test or Retic count 4. ESR)	15
	11.00 am – 1.00pm	Slides and Haematology case discussion	**(90)**
	1.00 pm – 2.00 pm	LUNCH	
	2.00 pm – 3.00 pm	Clinical Pathology case (urine exam 15 marks + CBC and PS 15 marks)	30
	3.00 pm – 3.30 pm	Blood bank exercise (Grouping/ Coomb's) -10	10
	3.30 pm – 4.30 pm	Clinical Pathology and Blood Bank Discussion	**(40)**
Day 3	8.30 – 9.45 am	Histopathology Slides (15 x5 marks) -the number could vary*. At least one case could be given which necessitates a complete report generation [One H & E slide along with IHC markers or one resection specimen with margins and lymph nodes or autopsy case with slides from multiple organs	**(75)**
	10.00- 11.30 am	Viva of Histopathology slides	
		Practical Total	**300**
	11.30 to 1pm	**Oral** – General Viva exam (50 marks)	**100**
		Logbook (10) + Thesis presentation (10) + Spotters viva (done in day1) (30)	
		Total	**400**
Practical - 300 (Histo – 150; Cytology – 55; Hematology- 55; Clinical Path & BB – 40) Viva – 100 (Oral exam 50, Spotter viva – 30; logbook 10, thesis presentation 10)			
*Additional slides could be given marks by reducing general viva marks, especially to increase weightage for cytology+haematology			

Day	Theme	Time	Exercise and mark distribution	Overall Marks
Day 1	Histopathology and Cytology Techniques including discussion.	8:45-10:45 am	1. Cytology case study/ OSPE (10 marks) 2. PAP staining of FNAC smear (10 marks) 3. Anyone staining-H &E /ZN/ PAS/ Perls /VG (10 marks) 4. Microtomy/ Artefacts (5 marks)	35
		10:45-11:00 am	Tea Break	
	Autopsy and Gross surgical anatomy including discussion	11.00 – 11.40 am	Gross specimens (8 x 5= 40 marks) $	60
		11.40 – 12.15 pm	Autopsy and cut ups (one case with organs and one organ for cutting) (10+10 marks)	
		12.15 -1.00 pm	Discussion of the above	
		1.00–1.30 pm	LUNCH	
	Haematology and cytology slides including discussion. Spotters	1:30-3:00 pm (buffer 15 mins)	Haematology and cytology slides (8+7 slides= 15x5=75 marks) – the number could vary*	75 +30 viva marks
		3.00-3.30 pm	Spotters (10x 3=30 marks)- marks included in viva	
		3:30-3:45 pm	Tea break	
		3.45 – 5.15 pm	Haematology and cytology slides discussion	
Day 2	Hematology, Clinical Pathology and Blood Bank exercises and discussion	8.30– 9.15 am	Haematology case study and one special technique depending on the case-15 marks. (1. MPO/PAS/Perls 2. PT or APTT 3. Sickling test or Retic count 4. ESR)	55
		9.15– 10.15 am	Clinical Pathology case (urine exam- 15 marks + CBC print out interpretation and PS making, staining, reporting -15 marks)	
		10:15-10:45am	Blood bank exercise (Grouping/ Coomb's) -10 marks	
		10.45– 11 am	Tea Break	
	Histopathology slides including discussion. Viva cases	11:00-12:30 pm (buffer 15 mins)	Histopathology Slides (15 x5 marks) -the number could vary*.	75 +20 viva marks
		12.30 – 1.00 pm (buffer for viva-either pedagogy or extra slides or a case study)	Flexible: 20 marks which would be added to viva and could be either 1. Pedagogy or 2. Extra slides if given or 3. One case which necessitates a complete report generation [E.g. H & E along with IHC markers or one resection specimen with margins	

			and LN or autopsy case with slides from multiple organs]	
		1.00 – 1.30 pm	LUNCH	
		1:45-3.30 pm	Histopathology slide discussion	
		3:30-3:45 pm	Tea break	
	Viva and mark compilation	3.45 – 4.45 pm	Viva – Logbook (10 marks) + Thesis discussion (20 marks) + General Grand Viva exam (20 marks) + Spotters (done in day1) (30 marks) + Flexible viva exercise (20 marks)	**100**
		4:45-5:15 pm	Practical Total	**300**
			Grand total	**400**
Practical - 300 (Histo 150; Cytology 55; Hematology 55; Clinical Path & BB 40); *Additional slides could be given marks by adding to flexible viva marks, especially to increase weightage for cytology+ haematology; $ Gross may include one fresh surgical specimen for grossing and giving bits.				