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UNIVERSITY

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MD Pathology

Curriculum and Syllabus 2015

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SRM Medical College Hospital & Research Centre

SRM University

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MD PATHOLOGY

1. GOALS

The goals of MD Pathology course is to produce a specialist who is competent to provide laboratory based diagnosis of illness, is able to teach undergraduates and to a certain extent postgraduates, and should have an idea regarding the rudiments of research. He or she should on successfully completing the training and examination be:

1.1. capable of offering a high quality diagnostic opinion in a given clinical situation with an appropriate and relevant sample of tissue, blood, body fluid, etc. for the purpose of diagnosis and overall wellbeing of the ill.

It is borne in mind that any of the sub-specialities mentioned might in future by itself emerge as a super-speciality. Hence, should provide sufficient training, competence and confidence in practice and diagnosis related to Histopathology (Surgical Pathology), Cytopathology, Hematology & Blood-Banking and Laboratory Medicine. Wherever possible the course should provide an opportunity to give some knowledge of the newer diagnostic specialties so that the student on qualifying in MD (Pathology) should be able to pursue further specialisation and training in these fields.

1.2 able to teach and share his knowledge and competence with others

1.2.A. Pathology forms the basis of understanding, diagnosis and hence the treatment of diseases. It is therefore an essential subject in the training and curriculum of various undergraduate and postgraduate courses of medicine and allied disciplines such as nursing etc. The MD (Pathology) course should therefore provide an opportunity to students to teach colleagues and students. There is a dearth of inspiring teachers and hence the course should attempt to bring out the best of such talents in these students so that, when given an opportunity, the successful student is equipped to take this responsibility in an academic institution. It is also expected that this aspect of the training of the student will enhance the capacity of expression and ability to explain scientific data in simple and unambiguous terms.

1.3 capable of pursuing clinical and laboratory based research.

1.3.A. The training should include means by which the student can pursue research either independently or as a part of a team. This would inculcate a spirit of enquiry and also make it possible to accurately record observations, analyse rationally and arrive at an unbiased conclusion of problems. This entire facet is essential to the overall practice of Pathology. It is recommended that a Dissertation be included as a part of partial fulfillment to the award of the degree of MD (Pathology).

2. BROAD OBJECTIVES (AT THE END OF THE COURSE)

2.1. Cognitive Domain

- 2.1.1. Diagnose routine and complex clinical problems on the basis of Histopathology (Surgical Pathology) and Cytopathology specimens, Blood and Bone Marrow examination and various tests under the domain of Laboratory Medicine (Clinical Pathology, Clinical Biochemistry/Chemical Pathology) as well as Blood Banking (Transfusion Medicine).
- 2.1.2. Interpret clinical and laboratory data with reasonable accuracy.
- 2.1.3. Able to correlate clinical and pathology data so that various clinical signs, symptoms and manifestations of disease can be correlated and explained.
- 2.1.4. Advice on the nature of appropriate specimens and the tests necessary to arrive at a diagnosis in a difficult or problematic case.
- 2.1.5. To be able to correlate clinical and laboratory findings with pathology findings at autopsy, identify discrepancies and the causes of death due to diseases (apart from purely metabolic causes).
- 2.1.6. Should be able to teach Pathology to undergraduates, postgraduates, nurses and paramedical staff including laboratory personnel.
- 2.1.7. Carry out research.
- 2.1.8. Maintain accurate records of tests and their results for reasonable periods of time so that these may be retrieved as and when necessary.
- 2.1.9. Make and record observations systematically that is of use for archival purposes and for furthering the knowledge of Pathology.
- 2.1.10. Able to systematically write a paper and publish in a journal.

- 2.1.11. Able to present a paper in a conference through an oral presentation and poster presentation.
- 2.1.12. Should be able to identify problems in the laboratory and offer solutions there of so that a high order of quality control is maintained.
- 2.1.13. Should be capable of effectively disposing laboratory waste to ensure minimisation of risk to infection and accidents to laboratory personnel.
- 2.1.14. Able to supervise and work with subordinates and colleagues in a laboratory.
- 2.1.15. Subject himself/herself to continuing education and constantly update his/her knowledge of recent advances in Pathology and allied subjects.

2.2. Psychomotor Domain

- 2.2.1. Able to perform most of the routine tests in a Pathology Laboratory including grossing of specimens, processing, cutting of paraffin sections making smears, making frozen sections and staining.
- 2.2.2. Able to collect specimens by routinely performed non-invasive out-patient procedures such as venepuncture, finger-prick, fine needle aspiration biopsy of superficial lumps and bone-marrow aspirates. It is implied that the complications of these procedures and handling of complications are apparent. Further, whenever necessary must be able to provide appropriate help to colleagues performing an invasive procedure such as a biopsy or an imaging guided biopsy.
- 2.2.3. Perform an autopsy, dissect various organ complexes and display the gross findings.
- 2.2.4. Should be familiar with the function, handling and routine care of equipment in the laboratory.

2.3. Affective Domain

- 2.3.1. Should be able to function as a part of a team that is essential for the diagnosis and management of a patient. He/she should therefore develop an attitude of cooperation with his/her colleagues so necessary for this purpose. It is implied that he/she will whenever necessary interact with the

patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.

- 2.3.2. Always adopt ethical principles and maintain proper etiquette in his/her dealings with patients, relatives and other health personnel.
- 2.3.3. Respect the rights of the patient including the right to information and second opinion.
- 2.3.4. Should seek and give second opinion only where necessary.
- 2.3.5. Provide leadership and inspire members of the team with whom he/she is involved with in the fields of diagnostic pathology, teaching and research.
- 2.3.6. Develop communication skills not only to improve word power for reporting and professional opinions but also to interact with patients, relatives, peers and paramedical staff.

3. COURSE OVERVIEW

Duration of the course

The period of certified study and training for the Post-Graduate MD PATHOLOGY shall be Three Academic years (36 months).

Commencement of Academic Session

The academic session for the Post-Graduate shall commence from May / June of the Academic Year.

Date of Examination

The students admitted up to May/June of the academic year shall be registered for that academic year and shall take up their Final Third Year regular examination in April/October of the academic year after completion of 3 years /36 months.

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.

Attendance

All students joining the postgraduate training programme shall work as full time residents during the period of training, attending not less than 80% (eighty percent) of the training during each calendar year, and will be given full time responsibility, assignments and participation in all facets of the educational process.

The period of training for obtaining the degrees shall be three completed years including the period of examination.

4. SCOPE OF TRAINING

While professional training in all branches is equally important, since they are inter-dependent and competitive, a balance of emphasis is desirable, as a guideline to the student. 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.

4.1. High Degree of Professional Competence

In the following fields in which a high degree of professional competence and theoretical knowledge is expected. The student is expected to know both the theoretical as well as practical aspects especially related to diagnosis of appropriate diseases.

4.1.1. 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.

4.1.1.1. 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 sub lethal and lethal injury. A clear concept of neoplasia, infections, metabolic and genetic disorders.

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

4.1.1.2. Systemic Pathology:

The study of normal structure and function of various organ systems and the

aetiopathogenesis, gross and microscopic alterations of structure and function of these organ systems in disease.

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

4.1.2. 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.

4.2. 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 as in 4.1. Some centers 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 subjects and therefore until such time as the situation demands, these subjects should be an integral part of postgraduate training in pathology.

4.2.1. Laboratory Medicine (Clinical Biochemistry/Microbiology including parasitology/Clinical Pathology).

4.2.2. Transfusion Medicine (Blood-Banking).

4.3. 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.

4.3.1. Immunopathology

4.3.2. Histochemistry

4.3.3. Immunohistochemistry

4.3.4. Cytogenetics

4.3.5. Medical statistics

4.3.6. Molecular Biology

4.3.7. Maintenance of records

4.3.8. Information retrieval, Computer, Internet in medicine.

A strong overview of sections such as Electron Microscopy, Radio-isotopes, Tissue Culture, etc provides the necessary foundation for one's career.

5. COURSE CONTENT

5.1. Surgical Pathology

5.1.1. Knowledge

5.1.1.1. 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.

5.1.1.2. Should be able to identify problems in the laboratory and offer viable solutions.

5.1.2. Skills

5.1.2.1. 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 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.

5.1.2.2. 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.

5.1.2.3. 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 at least 75% of the classical lesions being commonly encountered in the surgical pathology service without the aid of the clinical data.

5.1.2.4. Start the automatic tissue-processing machine and verbally demonstrate his/her understanding of the principles of its running.

5.1.2.5. Process a tissue, make a paraffin block and cut sections of good quality on a rotary microtome.

5.1.2.6. Stain paraffin sections with at least the following:

(i) Haematoxylin and eosin

(ii) Stains for collagen, elastic fibers and reticulin

(iii) Iron stain

(iv) PAS stain

5.1.2.7. Demonstrate understanding of the principles of:

(i) Fixation of tissues

(ii) Processing of tissues for section cutting

(iii) Section cutting and maintenance of related equipment

(iv) Differential (Special) stains and their utility

5.1.2.8. 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 15minutes.

5.1.2.9. Demonstrate the understanding of the utility of various immune histochemical stains especially in the diagnosis of tumour subtypes.

5.2. Autopsy Pathology

5.2.1. Knowledge

5.2.1.1. Should be aware of the technique of autopsy.

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

5.2.2. Skills

5.2.2.1. 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 alone in at least 90% of the autopsies in an average teaching hospital.

5.2.2.1.A. Students should have basic exposure to medico-legal autopsies.

5.2.2.2. 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.

5.2.2.3. 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.

5.3. Cytopathology

5.3.1. 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 (Cytohormonal status, malignancy, infection, etc.)

(i) Choice of site from which smears may be taken (as in the case of vaginal smears)

(ii) Type of smear (morning specimen, after specimen, pre-menstrual specimen, etc.)

(iii) Method of obtaining various specimens (urine sample, gastric smear, colonic lavage etc.)

5.3.2. Skills

5.3.2.1. Independently prepare and stain good quality smears for cytopathologic examination and be conversant with the principles and preparation of solutions of stains.

5.3.2.2. Demonstrate conversance with the techniques for concentration of specimens: i.e. various filters and cytocentrifuge.

5.3.2.3. 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.

5.3.2.4. Given the relevant clinical data, he/she should be able to independently and correctly :

(i) Evaluate hormonal status in all cases as may be required.

- (ii) 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.
- (iii) Demonstrate ability in the technique of screening and dotting the slides for suspicious cells.
- (iv) Indicate correctly the type of tumour, if present, in at least 75% cases.
- (v) Identify with reasonable accuracy the presence of organisms, fungi and parasites in at least 75% of cases.

5.4. Haematology

5.4.1. Knowledge

- 5.4.1.1. 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.
- 5.4.1.2. Should be conversant with various equipments used in the Haematology laboratory.
- 5.4.1.3. Should have knowledge of automation and quality assurance in Haematology.

5.4.2. Skills

- 5.4.2.1. 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.
- 5.4.2.2. Correctly and independently perform the following special tests, in addition to doing the routine blood counts:
 - (i) Haemogram including Reticulocyte and Platelet counts.
 - (ii) Bone marrow staining including stain for iron
 - (iii) Blood smear staining
 - (iv) Cytochemical characterization of leukemia with special stains like Peroxidase, Leukocyte Alkaline Phosphatase (LAP), PAS, Sudan Black, OilRed O, Acid Phosphatase (including Tartarate resistant) and Non-specific Esterase
 - (v) Osmotic fragility
 - (vi) Sickling phenomenon

- (vii) Bleeding time
- (viii) Clotting time
- (ix) Prothrombin time (PT)
- (x) Activated partial thromboplastin time (APTT)
- (xi) Haemoglobin electrophoresis, paper electrophoresis
- (xii) Coombs Test

5.4.2.3. Demonstrate familiarity with the principle and utility in diagnosis of the following:

- (i) Red cell indices
- (ii) Plasma haemoglobin
- (iii) Haemosiderin in urine
- (iv) Presumptive tests for complete antibodies
- (v) Ham's Acid test
- (vi) Serum electrophoresis
- (vii) Platelet function tests including platelet aggregation and adhesion and PF3 release
- (viii) Russell's viper venom time (RVVT)
- (ix) Coagulation Factor assays
- (x) Screening for coagulation factor inhibitors
- (xi) Fibrin Degradation Products (FDP), D-Dimers
- (xii) Monitoring of anticoagulant therapy
- (xiii) Tests for thrombosis: Lupus anticoagulant (LAC), Anti cardiolipin Antibody (ACA), Activated Protein C Resistance (APCR), Protein C (Pr C), Protein S (Pr S), Anti thrombin III (AT III)
- (xiv) Serum ferritin
- (xv) Serum iron and total iron binding capacity
- (xvi) Immunophenotyping
- (xvii) Cytogenetics

5.4.2.4. Demonstrate verbally and in writing, his/her understanding of the principles of the above tests their utility in diagnosis and interpretation of results.

5.4.2.5. Perform a successful bone marrow aspiration/ilic crest biopsy and stain the peripheral and bone marrow smears with Romanowsky stains.

5.4.2.6. 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.

5.4.2.7. Posses working knowledge of the following:

- (i) Bone marrow transplantation
- (ii) Prenatal diagnosis of genetic haematological diseases
- (iii) Molecular biology of haematological diseases

5.5. Laboratory Medicine

5.5.1. Knowledge

5.5.1.1. Demonstrate familiarity with the normal range of values of the chemical content of body fluids, significance of the altered values and interpretation thereof.

5.5.1.2. 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.

- (i) Renal function test
- (ii) Liver function test
- (iii) Gastric and Pancreatic function
- (iv) Endocrine function test
- (v) Tests for malabsorption

5.5.1.3. Explain the biochemical principles involved in the above estimations.

5.5.1.4. Know the principles, advantages and disadvantages scope and limitation of Automation in laboratory.

5.5.1.5. Learn the principles and methodology of quality control in laboratory.

5.5.2. Skills

5.5.2.1. 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.

5.5.2.2 Demonstrate familiarity with and successfully perform a routine Urinalysis including Physical, Chemical and Microscopic, examination of the sediment..

5.5.2.3. Independently and successfully perform a complete examination; physical, chemical and cell content of Cerebrospinal Fluid (C.S.F). , Pleural and Peritoneal fluid.

5.5.2.4. Successfully perform an examination of Peripheral Blood for the commonly occurring parasites.

5.5.2.5. Independently perform a Semen analysis.

5.5.2.6. Independently and correctly perform at least the following Quantitative Estimations by Manual Techniques and/or Automated Techniques.

(i) Blood urea

(ii) Blood sugar

(iii) Serum Proteins total & fractional

(iv) Serum Bilirubin total & fractional

5.5.2.8. Demonstrate familiarity with the following Quantitative Estimations by Automated Techniques.

(i) Serum cholesterol*

(ii) Uric acid

(iii) Serum Transaminases (ALT and AST/SGOT and SGPT)

(iv) Serum Alkaline Phosphatase

(v) Creatinine

(vi) Serum calcium and phosphorous

(vii) Serum Electrolyte (Na⁺ and K⁺)

(viii) Serum amylase

5.5.2.9. Demonstrate familiarity with:

(i) Determination of bicarbonates

(ii) Blood gas analysis.

5.5.2.10. Must be familiar with principles of Instrumentation, use and application of the commonly used laboratory equipment.

5.6. Transfusion Medicine (Blood Banking)

5.6.1. Knowledge

It is expected that students should possess knowledge of the following aspects of Transfusion Medicine.

5.6.1.1. Basic immunology

5.6.1.2. ABO and Rh groups

5.6.1.3. Clinical significance of other blood groups

5.6.1.4. Transfusion therapy including the use of whole blood and RBC concentrates.

5.6.1.5. Blood component therapy.

5.6.1.6. Rationale of pre-transfusion testing.

5.6.1.7. Infections transmitted in blood.

5.6.1.8. Adverse reactions to transfusion of blood and components

5.6.1.9. Quality control in blood bank

5.6.2. Skills

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

5.6.2.1. Selection and bleeding of donors

5.6.2.2. Preparation of blood components i.e. Cryoprecipitates, Platelet concentrate, Fresh Frozen Plasma, Single Donor Plasma, Red Blood Cell concentrates.

5.6.2.3. ABO and Rh grouping.

5.6.2.4. Resolving ABO grouping problems by secretor status in saliva and expanded panel.

5.6.2.5. Demonstrate familiarity with Antibody screening and Cross matching by

(i) LISS (Low-ionic salt solution)

(ii) AHG (Anti-Human Globulin)

5.6.2.6. Steps to be taken if the above are positive.

5.6.2.7. Demonstrate familiarity with Antenatal and Neonatal work

(i) Direct antiglobulin test

(ii) Antibody screening and titre

(iii) Selection of blood for exchange transfusion

5.6.2.8. Demonstrate familiarity with principle and procedures involved in

(i) Resolving ABO grouping problems.

(ii) Identification of RBC antibody.

(iii) Investigation of transfusion reaction.

(iv) Testing of blood for presence of

(a) HBV (Hepatitis B Virus Markers).

(b) HCV (Hepatitis C Virus Markers)

(c) HIV (Human Immunodeficiency Virus Testing)

(d) VDRL

5.7. Basic Sciences (in relation to Pathology)

5.7.1. Immunopathology

5.7.1.1. Knowledge

(i) Demonstrate familiarity with the current concepts of structure and function of the immune system, its aberrations and mechanisms there of.

(ii) Demonstrate familiarity with the scope, principles, limitations and interpretations of the results of the following procedures employed in clinical and experimental studies relating to immunology.

(a) ELISA techniques

(b) Radio immuno assay

(c) HLA typing

5.7.1.2. Skills

- (i) Demonstrate familiarity with simple immunological tests used in diagnosis of diseases and in research procedures.
 - (a) Immuno electrophoresis
 - (b) Immuno fluorescence techniques especially on kidney and skin biopsies
 - (c) Countercurrent electrophoresis for demonstration of antigen
 - (d) Latex agglutination
 - (e) Anti-nuclear Factor (ANF)
 - (f) Anti-neutrophil cytoplasmic antibody (ANCA)

5.7.2. Electron Microscopy

5.7.2.1. Knowledge

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

5.7.2.2. Skills

- (i) Familiar with proper fixation, processing and staining of tissues for electron microscopy.
- (ii) Recognize the appearance of the normal sub cellular organelles and their common abnormalities (when provided with appropriate photographs).

5.7.3. Enzyme Histochemistry

5.7.3.1. Knowledge

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

5.7.4. Immunohistochemistry

5.7.4.1. Knowledge

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

5.7.4.2. Skills

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.

5.7.5. Molecular Biology

5.7.5.1. Knowledge

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

5.7.5.2. Skills

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

5.7.6. Principles Of Medical Statistics

5.7.6.1. Knowledge

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

5.7.7. Radio Isotope and Autoradiography

5.7.7.1. Knowledge

Should be familiar with the principles of the commonly used radioisotopes in medicine and autoradiography, and the instruments used to measure radio activity.

5.7.8. Tissue Culture

5.7.8.1. Knowledge

Should be familiar with methods of tissue culture.

5.7.9. Cytogenetics

5.7.9.1. Knowledge

Should be familiar with methods of Karyotyping and Fluorescent in-situ Hybridisation (FISH).

*** Important Note**

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 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.

6. RESEARCH

All efforts must be made so that research methodology is apparent at the end of the course. It is recommended that students submit a Thesis 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.

The following are the points or guidelines which may be expected of the student at the end of the course.

- 6.1. Recognize a research problem – basic or applied
- 6.2. Clearly state the objectives in terms of what is expected to be achieved in the end.
- 6.3. Plan rational approaches with appropriate controls with full awareness of the statistical validity of the size of experimental material.
- 6.4. Carry out most of the technical procedures required for the study.
- 6.5. Accurately and objectively record on systematic lines the results and observations made.
- 6.6. Analyse the data with the aid of an appropriate statistical analysis, if necessary.

6.7. 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.

6.8. Take photomicrographs, of a quality fit for publication in an international Journal

6.9. Write the thesis or a scientific paper in accordance with the prescribed instructions, as expected of international standards.

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

7. TRAINING METHODS

Essentially, 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 the research investigator. The training programme should be designed to enable the student to acquire a capacity to learn and investigate for himself/herself, 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/herself. Interactive discussions are to be preferred over didactic sessions.

The student must blend as an integral part of the activities of an academic department that usually revolves around three equally important basic functions of teaching, research and service. As mentioned earlier the emphasis is recommended under a residency programme 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 Fine needle aspiration of superficial lumps.

- 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 etc.
- 7.13. Laboratory-work.
- 7.14. Use and maintenance of equipment.
- 7.15. Maintenance of records.
- 7.16. Teaching undergraduates and paramedical staff.

7.A. For the purpose of thesis, as far as possible, each individual must be given the freedom of choice of his/her own subjects 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 will be on a topic on which there is general interest, expertise and facilities with the faculty Interdepartmental collaboration should be encouraged to widen the scope and outlook of the research proposal and training.

8. 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 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 organising 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 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. 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 and Autopsy -13 months
- (ii) Laboratory Techniques- 1 month
- (iii) Haematology- 6 months
- (iv) Cytopathology- 5 months
- (vi) Thesis Work- 1 month
- (vii) Clinical Pathology- 4 months
- (viii) Transfusion Medicine/Blood Bank- 2 months
- (ix) Basic Sciences including Immunopathology,
Microbiology and Biochemistry -1 month
- (x) Elective/reorientation- 1 month
- (xi) Peripheral posting-1 month

Total 35 months

8.A.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.

8.B. All students joining the postgraduate training programme shall work as full time residents during the period of training, attending not less than 80% (eighty percent) of the training during each calendar year, and will be given full time responsibility, assignments and participation in all facets of the educational process.

The period of training for obtaining the degrees shall be three completed years including the period of examination.

9. SCHEME OF EVALUATION

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

9.1. Internal (Formative) Assessment

Internal Assessment must be regularly conducted 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.

9.1.1. 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 student has participated.

9.1.2. Research work should be assessed or reviewed every six months. The protocol and the final results should be presented to the entire department.

9.1.3. 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

The assessment might be graded as excellent, good, above average, average, below average or poor.

9.2. University (Summative) Assessment

This would include assessment of the thesis and a formal examination on the theoretical and practical aspects of the speciality of Pathology.

9.2.3. There shall be four theory papers

Paper I - General Medical and Surgical Pathology including applied aspects in Pathology

Paper II - General Pathology

Paper III - Systemic Pathology

Paper IV - Recent advances in Immunopathology, Haematology and Laboratory Techniques

9.2.5. Each paper should have two long questions (LAQ) and ten short answer questions (SAQ)

9.2.6. Practical Examination should be conducted over a minimum period of two days.

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

- (i) Clinical Pathology: Discussion of a clinical case history
Plan relevant investigations of the above case
Two investigations should be performed
Complete urinalysis
- (ii) Haematology: Discuss haematology cases given the relevant history
Plan relevant investigations
Perform at least two tests.
Identify electrophoresis strips, osmotic fragility charts etc.
Examine, report and discuss five cases given the history and relevant blood smears and/ or bone marrow aspirate smears

- (iii) Transfusion: Perform blood grouping, Coomb's test
Medicine Perform the necessary exercise given a relevant history
- (iv) Histopathology: Examine, report and discuss 15 histopathology slides
- (v) Cytopathology: Discuss five cytopathology cases given the relevant history and slides
- (vi) Histotechniques: Perform Section cutting, Haematoxylin and Eosin stain and any special stain on a paraffin section
Report on a frozen section
- (vii) Autopsy: Given a case history and relevant organs (with or without slides) give a list of anatomical diagnosis in a autopsy case.
- (viii) Gross Pathology: Describe findings of gross specimens, give diagnosis and identify the sections to be processed
- (vii) Basic Sciences: Identify electron micrographs
Identify charts on immunological tests including staining for direct/indirect immune fluorescence
Identify histochemical and immune histochemical stains, genetics and recent techniques such as PCR.

9.2.7. *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. Questions on the thesis may be asked at this time.

9.2.8. 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%.

9.2.A. *It is recommended that attempts be made to ensure that examinations be as objective as possible. The introduction of structured short answers, multiple choice questions and objective-structured practical examinations (OSPE) may be considered. Nevertheless the value of long answer questions in evaluating a student's ability to comprehend and systematically explain scientific literature*

cannot be undermined. Similarly viva-voce, though subjective allows an in-depth examination of the student's strengths and weaknesses in the subject.

10. CRITERIA FOR DEPARTMENTS TRAINING STUDENTS

It is recommended that any department that wishes to train a student leading to the award of the postgraduate degree in MD (Pathology) should fulfil the following criteria.

10.1. The department should be part of a teaching hospital attached or affiliated to a Medical College and/or University or should be a deemed university or autonomous institution recognised by appropriate authorities including the Medical Council of India.

10.2. The institution should have various departments encompassing different medical (includes all aspects of medical sciences and not merely the subject of medicine) specialties and super specialties so that there is no dearth of clinical material, there is adequate scope of interaction with different departments and overall training of the student as given earlier.

10.3. Every thesis shall have one Guide and at least one Co-guide from the department. Co-guides from other departments may be opted as necessary. In the event of the Guide leaving or retiring, the senior-most Co-guide from the department shall take over as the Guide. Institutional/University guidelines are to be followed regarding the appointment of Guides. It is recommended that at any given time one Faculty member should not be the Guide for more than five students. No such limit can be applied to Co-guides.

10.A. *It must be emphasised that the above are only guidelines and it is necessary to apply the rules and regulations as approved by the Medical Council of India, concerned Universities and the institution.*

11. 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.

11.1 Journals and Periodicals

- 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
- Journal of Pathology
- Journal of Clinical Pathology
- Laboratory Investigation
- Modern Pathology
- Pathology
- Seminars in Hematology
- Seminars in Diagnostic Pathology
- Virchows Archives

- Year Book 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, 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.

12. APPENDICES

MAINTENANCE OF LOG BOOK

- Every Post Graduate student shall maintain a record of skills he /she has acquired during the three years training period certified by the various Head of departments where he /she has undergone training including outside the institution.
- The student should also participate in the teaching and training programs of Under Graduate students of medical, Dental and other paramedical courses, both in Theory and Practicals from the first year onwards of the Post Graduate Degree course.
- In addition the Head of the department should involve their post graduate students in Seminars, Journal clubs, group discussions and participation in work sops, CME program's national and international conferences organized by the Department, Institution and outside the institution in the state and outside the state.

- d. Every Post Graduate student should be encouraged to present short title papers in conferences and improve on it and submit them for publication in indexed journals. Motivation by the Head of the Department of essential in this area to sharpen the skills of the Post Graduate students.
- e. The Head of the Department should scrutinize the log book every three months and certify the work done.
- f. At the end of the course the student should summarise the contents and get the log book certified by the Head of the Department and submit the log book at the time of the University Practical Examination for the scrutiny of the board of examiners.

It is preferable that a post graduate student during the course to present one poster presentation and /or to read one paper at a national /state conference and /or to present one research paper which can be published/accepted for publication/sent for publication during the period of his/her postgraduate studies.

**MODEL EVALUATION SHEET FOR ACADEMIC ACTIVITIES/
PRESENTATIONS**

Journal Club/Seminar

Name:

Topic:

Date:

Sl. No	Points to be considered	Score of Faculty Members				
		01	02	03	04	05
01	Choice of article (Journal Club) or topic of seminar (if not allotted)					
02	Understanding of the subject					
03	Whether relevant cross-references and articles have been consulted					
04	Overall preparation					
05	Whether strengths, weaknesses & controversies have been presented					
06	Cogency of presentation					
07	Use of audio-visual aids					
08	Response to questions					
09	Time scheduling					
10	Overall Performance					

MEAN SCORE

Guidance to the scoring scheme that is to be adopted may be incorporated and separate sheets may be circulated to individual Faculty Members that can be compiled subsequently for taking average Signatures of the Faculty Members should be obtained in the appropriate sheets.

MODEL ASSESSMENT RECORD

Name:		Date of Admission		Assessment	
Period:					
Posting/Characteristic		Score	Posting/Characteristic		Score
Posting	Surgical Pathology		Academic	Journal Club/Seminar	
	Cytopathology			Aptitude	
	Haematology			Competence	
	Transfusion Medicine			Overall Performance	
	Laboratory Medicine		Research	Aptitude	
	Autopsy			Performance	
	Others (Please Specify)		Service	Attitude towards patients/Colleagues	
Attendance	Regularity & Punctuality			Responsibilities towards duties	
<p>Special Remarks if any:</p> <p>OVERALL GRADING:* <input type="checkbox"/></p> <p>Date : Signature of Head/Faculty in charge</p>					

- **Grading may be done from A+ (Excellent) to C (Poor)*
- *One form is to be filled for each student by each Faculty Member and the results consolidated.*
- *If a student is not posted in a particular branch during the period under review then this must be noted.*
- *All Grades especially those indicative of "Below average" or "Poor" performance must be communicated to the student.*

PROPOSED WEEKLY TIME TABLE FOR MD PATHOLOGY

8.00 AM - 4.00 PM

DAY	8.00 - 12.00 AM	12.00 - 1.00 NOON	1.00 - 2.00 PM	2.00 - 4.00 PM
Monday	Postings in Central Laboratory - HP - Haematology - Cl. Pathology - Cytology	Journal Club	LUNCH	Under graduate tutorials/ Practicals
Tuesday		Gross pathology		
Wednesday		Histopathology		
Thursday		Haematology/Cytology		
Friday		Clinical Pathology		
Saturday		Recent advances /WHO seminars		

FINAL SCHEME OF EVALUATION

THESIS

Every student registered as post graduate shall carry out work on an assigned research project under the guidance of a recognized post graduate teacher, the result of which shall be written up and submitted in the form of a thesis.

Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature. Thesis shall be submitted at least six months before the theoretical and clinical / practical examination.

The thesis shall be a bound volume of a minimum of 50 pages and not exceeding 75 pages of typed matter (Double line spacing and on one side only) including certification, acknowledgements, annexure and bibliography.

Thesis should consist of

- (a) Introduction
- (b) Review of literature
- (c) Aims and objectives
- (d) Material and methods
- (e) Result
- (f) Discussion
- (g) Summary and conclusion
- (h) Tables
- (i) Annexure
- (j) Bibliography

Six copies of thesis shall be submitted six months prior to the commencement of the theory examinations on the date prescribed by the Controller of Examinations of this University. The thesis should be approved by the Professor of that branch and the same has to be forwarded to the Controller of Examinations, by the head of the department through the Dean of the college.

Two copies in addition are to be submitted as an electronic version of the entire thesis in a standard C.D. format by mentioning the details and technicalities used in the C.D. format.

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; and on the acceptance of the thesis by two examiners, the student shall be allowed to appear for the final examination.

EVALUATION OF THESIS :

ACCEPTED / NOT ACCEPTED

No marks will be given

SCHEME OF EVALUATION

THEORY DISTRIBUTION MARKS

SECTION	DETAILS	MARKS	TIME	TOTAL
THEORY	Paper I - General Medical and surgical Pathology including applied aspects in Pathology	100	3 hours	400
	Paper II - General Pathology	100	3 hours	
	Paper III - Systemic Pathology	100	3 hours	
	Paper IV - Recent advances in Immunopathology, Haematology and Laboratory Techniques	100	3 hours	

Distribution of Marks for questions.

2 Essays 2x20= 40 marks

10 Short Notes 10x6= 60 marks

100

PRACTICAL EXAMINATION**TOTAL MARKS: 200****2 Days Practical Examination****PRACTICAL DISTRIBUTION MARKS****DAY-I**

SECTION	DETAILS	MARKS	TIME	TOTAL	
PRACTICALS	Autopsy	15	2 hours	200	
	Gross: Spotter & Discussion	20	1 hour		
	Histotechnology H & E Spl.Stains PAP	20	2 hours		
	Haematology & cytology (5+5=10 No.x4)	40	2 hours		
<u>DAY - 2</u>					
SECTION	DETAILS	MARKS	TIME		
PRACTICALS	Histopathology Slides (15 Nos) (15X4)	60	2 hours		
	Clinical Pathology Patient/Paper Case Blood, Urine, Immunology	25	1 ½ hours		
	OSPE: Immunohistochemistry, Haematology, Molecular Cytogenetics, Special Techniques	20	1 hours		
Viva+Pedagogy (50+50) 1½hr					100
Practical total marks				300	

Note: No. of students to be examined 8 per day for Practical/Viva

MARKS QUALIFYING FOR A PASS

	MAXIMUM MARKS	QUALIFYING FOR A PASS 50% MARKS
Theory Examination	400	200
Practical Including clinical and Viva voce examination	300	150

A student shall secure not less than 50% marks in each head of passing, which shall include 1.Theory 2.Practical including clinical and viva voce examination.

* “The postgraduate medical students are required to pass theory and practical examinations separately. An examinee should obtain minimum 40% marks in each theory paper and not less than 50% marks cumulatively in all the four papers for Degree examination to be cleared as “Passed” at the said Degree examination”

**As per Medical Council of India notification date 03.09.2014 and the same approved in the 28th Academic council meet of SRM University held on 23/03/2015.*

EXAMINATION AND EVALUATION

(1) EXAMINERS

(a) All the Post Graduate Examiners shall be recognised Post Graduate Teachers holding recognised Post Graduate qualifications in the subject concerned.

(b) 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 recognised universities from outside the State and other two will be internal examiners of which one will be from this institution.

(c) Under exceptional circumstances, examinations may be held with 3 (three) examiners provided two of them are external and Medical Council of India is intimated 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.

(d) The guidelines regarding appointment of examiners are as follows;-

1. No person shall be appointed as an examiner in any subject unless he/she fulfils the minimum requirements for recognition as a Post Graduate teacher as laid down by the Medical Council of India and has teaching experience of 8 (Eight) years as a Lecturer / Assistant Professor out of

which he has not less than 5 (Five) years teaching experience after obtaining Post Graduate degree. For external examiners, he should have minimum three years experience of examinership for Post Graduate diploma in the concerned subject. Out of internal examiners, one examiner shall be a Professor and Head of Department or Professor.

2. An external examiner may be ordinarily been appointed for not more than three years consecutively. Thereafter he may be reappointed after an interval of two years.
3. The internal examiner in a subject shall not accept external examinership for a college from which external examiner is appointed in his subject.
4. The same set of examiners shall ordinarily be responsible for the written, practical or part of examination.
5. There shall be a Chairman of the Board of paper – setters who shall be an external examiner and shall moderate the question papers.
6. The Head of the Department of the institution concerned shall ordinarily be one of the internal examiners and second internal examiner shall rotate after every two year.

(2) Number of candidates

The maximum number of candidates to be examined in Clinical / practical and Oral on any day shall not exceed six for M.D. degree examination.

3) 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.

(4) Doctor of Medicine (M.D.) Pathology

M.D. examination shall consist of Thesis, Theory Papers, and clinical/Practical and Oral examinations.

Evaluation of Answer Scripts

The answer books will be valued by two examiners. One of the two examiners will be from this university and the other will be from any other university. The Average of the two marks secured by the candidate will be taken into account. If the difference between two marks exceeds 20%, the answer scripts shall be valued by the third examiner. The average of the nearest two marks shall be considered as the final mark.

MODEL QUESTION PAPER

MD PATHOLOGY

PAPER - I

GENERAL MEDICAL AND SURGICAL PATHOLOGY INCLUDING APPLIED ASPECTS IN PATHOLOGY

ESSAY:

2x20=40

1. Describe endothelial cells. Write in detail about role of endothelial cell in inflammation and thrombosis with suitable diagram
2. Classify jaundice. Write in detail about role of various Lab Investigations in diagnosis of Jaundice.

Write Short notes on :

10x6=60

1. Opportunistic infections in AIDS
2. GIST
3. Lab Investigations a male infertility
4. Complication of diabetes mellitus
5. Paraneoplastic syndrome
6. ANCA
7. Synovial biopsy - Interpretation
8. Lab Diagnosis of meningitis
9. Cystic lesions in Kidney
10. Helicobacter pylori

MD PATHOLOGY
PAPER - II
GENERAL PATHOLOGY

ESSAY:

2x20=40

1. Define apoptosis. Discuss the mechanisms, morphological and biochemical changes in apoptosis. Add a note on the various investigations to assess apoptosis.
2. Discuss the mechanisms of tumour invasion and types of metastasis

Write short notes

10x6=60

1. Pathological calcification
2. Free radical injury
3. Nitric oxide
4. Genomic imprinting
5. Cell adhesion molecules
6. Telomeres and cell aging
7. Stem cells
8. Phagocytosis
9. Obesity and disease
10. DNA microarray

MD PATHOLOGY
PAPER - III
SYSTEMIC PATHOLOGY

ESSAY:

2X20=40

1. Classify renal tumours. Discuss in detail pediatric renal tumours.
2. Discuss metabolic disorders of bone

Write short notes

10x6=60

1. Recent diagnostic and prognostic indices in endometrial carcinoma
2. Fungal infections of Lung
3. Cystic diseases of the breast
4. Hirschsprung's disease
5. Testicular biopsy in infertility
6. Cardiac myxoma
7. Interstitial lung disease
8. Early gastric carcinoma
9. Theories of atherosclerosis
10. Malakoplakia

**MD PATHOLOGY
PAPER - IV**

**Recent Advances in Immunopathology, Haematology, Principles and
Application to Technological Advances in Laboratory Services**

ESSAY:

2X20=40

1. Classify acute leukemia. Give a brief account of acute lymphoid leukemia mentioning the laboratory findings, cytogenetic findings and prognostic factors.
2. Discuss recent diagnostic techniques used in cytopathology

Write short notes

10x6=60

1. Microalbuminuria
2. Automation in hematology
3. Laboratory findings in AIDS patients
4. Opportunistic infections
5. Quality control in the blood bank
6. Applications of flow cytometry
7. Applications of molecules biology techniques
8. Scleroderma
9. Disseminated intravascular coagulation
10. Aetiology and pathogenesis of aplastic anaemia

RECOMMENDED BOOKS

1. Histology for Pathologists. *Stacey Mills.E 4th Edition, Lippincott (Ed)*, Raven Press, New York. 2012.
2. General Pathology *JB Walter, MS Israel. 7th Edition*, Churchill Livingstone, Edinburgh, 2009.
3. Robbins Pathologic Basis of Disease *Ramzi S.Cotran, Vinay Kumar, Stanley L Robbins. 8th Edition Saunders Co., Philadelphia, 9th edition 2014.*
4. Pathology - *Emanuel Rubin, John L Farber. JB 7th Edition Lippincott Co., Philadelphia, 2014.*
5. Anderson's Pathology - *Ivan Damianov 2 volume (Ed). 10th Edition The CV Mosby Co., St. Louis, 2009.*
6. Ackerman's Surgical Pathology. *Juan Rosai Mosby. St. Louis, 10th edition 2011.*
7. Sternberg's Diagnostic Surgical Pathology - *Stacey E. Milles, Stephen S Sternberg, 6th edition. Lippincott, William Wilkins. Philadelphia, 2 volume Lippincott, 2015.*
8. Diagnostic Histopathology of Tumours. *Christopher DM Fletcher (Ed). Churchill Livingstone. Edinburgh. 2 volume 4th Edition Churchill Livingston, New York, 2013.*
9. Soft Tissue Tumors. *Franz M Enzinger, Sharon W Weiss. 6th Edition Mosby, 2013.*
10. Dahlin's Bone Tumors. *K Krishnan Unni. 6th Edition Lippincott-Raven Publishers, Philadelphia, New York. 2010*
11. Greenfield's Neuropathology. *J Seth Love and (Ed), London. 8th Edition Hodder Arnold, 2008.*
12. Russell & Rubenstein's Pathology of the Tumours of the Nervous System.

- Darrell D Bigna. Roger E Mc Lendon, Janet M Bruner (Eds.) 7th Edition, Arnold, London. 2006.*
13. *Rosen's Breast Pathology. Syed.A. Heda. 4th Edition Lippincott-Raven Publishers, Philadelphia, New York, 2014.*
 14. *Haynes and Taylor Obstetrical & Gynaecological Pathology. H Fox, M Wells. 2volume 5th Edition Churchill Livingstone New York, 2003.*
 15. *Heptinstall's Pathology of the Kidney. J Charles Jenette, Jean L Olson, Melvin M chwartz, Fred G Silva (Eds.). 2volume 7th Edition Lippincott-Raven Publishers, Philadelphia, New York, 2014.*
 16. *Potter's Pathology of the Fetus & Infant. Enid Gilbert-Barnes (Ed). 2 volume 2nd Edition Elsevier, 2007.*
 17. *Lever's Histopathology of the Skin, David Elder (Ed), 11th Edition Lippincott-Raven Publishers, Philadelphia, New York, 2014.*
 18. *Theory and Practice of Histological Techniques, Bancroft JD, Stevens A, Turner DR, 7th Edition Churchill Livingstone, Edinburgh, 2012.*
 19. *Manual & Atlas of Fine Needle Aspiration Cytology. Svante R Orell, Gregory F Sterrett, Max NI Walters, Darrel Whitaker. 5th Edition Elsevies, Churchill Livingstone, London, 2012.*
 20. *Diagnostic Cytology and its Histopathologic Basis, Koss LG, 5th Edition. J.B. Lippincott, Philadelphia, 2006.*
 21. *Comprehensive Cytopathology, Bibbo M, 4th Edition Saunders Co., Philadelphia, 2008.*
 22. *William's Hematology Beutler E, Lichtmann MA, Coller BS, Kipps TJ, 8th Edition McGraw Hill New York, 2010.*
 23. *Postgraduate Hematology Hoffbrand AV, Lewis SM, Tuddenham EGD, 6th Edition Johnwiley, 2011.*

24. Wintrobe's Clinical Hematology, Lee GR, Foerster J, Lupeus J, Paraskevas F, Gveer JP, Rodgers GN, 2 volume 13th Edition Lippincott , Baltimore, 2013
25. Practical Haematology, Dacie JV, Lewis SM, 11th Edition Churchill Livingstone, Edinburgh, 2011.
26. Clinical Diagnosis and Management by Laboratory Methods, Henry JB, 22th Edition WB Saunders. (Indian Edition, Eastern Press, Bangalore), 2011.

A clear definition of goals is the key to success.

- Edison Montgomery

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