

ALL INDIA INSTITUTE OF MEDICAL SCIENCES (AIIMS) NAGPUR

DM HEMATOPATHOLOGY CURRICULUM

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HEMATOPATHOLOGY — D M

1. AIMS AND OBJECTIVES

The department of Pathology offers postdoctoral course in laboratory haematology (DM hematopathology), to ensure that doctors from Pathology background have opportunity to train in advanced hematopathology services.

The program has been designed to give the resident comprehensive training in laboratory and clinical haematology, to enable them to follow a subsequent career pathway in either academic or community haematology.

2. PROGRAM OUTCOME

At the end of training in hematopathology, it is **expected that the qualified resident will be able to:**

1. Diagnose all patients with non-malignant and malignant haematological disorders.
2. Perform independently different laboratory haematological investigations used to diagnose haematological disorders.
3. Interpret laboratory data and synthesize laboratory and clinical data so as to provide rational solutions for patients with haematological problems.
4. Supervise the activities of a laboratory services where necessary.
5. To have the efficiency of conducting all types of haematological investigations.
6. Should have clinical perspective of diseases and preliminary knowledge about management and its effect on diagnostic assays
7. To have in depth knowledge and ability for molecular testing including for antenatal screening and prenatal diagnosis of haematological disorders.

Cognitive Domain	
Sr. No.	Competencies
1.1	Each student would have to develop a clear understanding of the patho-physiology, diagnosis and prognostication of disorders related to Hematology. This has to be accomplished by reading textbook of Hematology and various related articles available on scientific/medical journal sites on web.
1.2	Each student during this period is expected to learn about utilizing the medical literature. This includes the ability to use electronic resources such as PubMed, etc. to search for relevant topics, as well as the ability to critically appraise the merits and deficiencies of an article. At the end of the course, the student should be able to:
1.3	Use the aspects of applied physiology, biochemistry and Pathology for daily diagnostic hematology practices
1.4	Plan work up in a suspected case of hematological disorder
1.5	Advise advance testing based on the results of preliminary work up for diagnosis and prognostication of patient
1.6	Resident should be able to comprehend clinical inputs and collate with alb data from various tests performed, analyse all the information available to arrive at final diagnosis of hematological disorders.
1.7	Should be able to interpret advance genetic and molecular test reports including cytogenetic karyotyping /FISH and NGS etc.to provide inputs
1.8	Plan and execute Research in hematology in various settings
1.9	Plan lab set up and establish quality assurance system for laboratory
2.0	Exhibit good understanding of critical alert, TAT and other Quality indicators of laboratory and troubleshooting of system failures in laboratories
2.1	Organize multi-disciplinary conference and participate in discussion as lab expert
2.2	Discuss and explain critical appraisal and application of guidelines and protocols
2.3	Demonstrate good understanding of the managerial & administrative responsibilities as a hematology lab incharge
2.4	Exhibit ability for intra/inter departmental coordination for diagnostic work up
2.5	Manage laboratory services in advance and rural setting

Affective Domain	
Sr. No.	2.1 Comfort and Pain-Relief

2.1(a)	Understanding patients concerns and perspective and counseling of patients before procedures like bone marrow and lumbar puncture
	2.2 Health Systems Management
2.2 (a)	Leadership in managing lab and team of technicians
2.3 (a)	Communication skills Communication with hematology patients and their relatives about test results Communication with members of the health care team/ clinical colleagues
2.3 (b)	Professional relationships with patients and relatives Understanding of cultural and religious beliefs and awareness of their impact on decision making while doing genetic counseling after results of HPLC and genetic assays Understanding of privacy, dignity, confidentiality and legal constraints on the use of patient data
2.3 (c)	Professional relationships with members of the health care team/ technical staff- Collaboration, consultation, team work Supervision and delegation of duties and responsibilities to juniors and others

Psycho motor domain	
At the end of the course, the student should have acquired skills in the following:Details of these are described above under heading of training program	
S. No.	Competencies
	3.1 Morphology and general hematology
3.1 (a)	Peripheral smear, bone marrow and lymph node morphology interpretation
3.1 (b)	Special hematology and cytochemistry stain
3.1 (c)	CBC data and graph interpretation
3.1 (d)	Quality control monitoring of CBC and other analyzers
3.1 (e)	Validation of various manual assays and automated counters
	3.2 Hemostasis and thrombosis laboratory
3.2 (a)	Platelet count and morphology assessment

3.2 (b)	Perform and interpret platelet function assay
3.2 (c)	Screening coagulogram -perform and interpret
3.2 (d)	Correction studies
3.2 (e)	Factor assay
3.2 (f)	DIC profile
3.2 (g)	Inhibitor screen and bethesda assay
3.2 (h)	Work up for von willebrand disease
3.2 (i)	Lupus antocoagulant testing
3.2 (j)	Pr C, Pr S, Anti thrombin and APCR
	3.3 Hemolytic Anemia Laboratory
3.3 (a)	Sickling and solubility test
3.3 (b)	Hb HPLC performance and interpretation
3.3 (c)	Hb H preparation/ Heinz body testing
3.3 (d)	G6PD screening assay
3.3 (e)	Osmotic fragility test
3.3 (f)	Cryoglobulin testing
	3.4 Flow cytometry
3.4 (a)	Leukemia and lymphoma immunophenotyping
3.4 (b)	Platelet flow cytometry
3.4 (c)	Lymphocyte subset analysis
3.4 (d)	HLA B27
3.4 (e)	Stem cell enumeration
3.4 (f)	PNH assay by Flow
3.4 (g)	MRD monitoring for leukemias and lymphomas
	3.5 Molecular Pathology
3.5 (a)	Perform basic PCR and modification
3.5 (b)	DNA /RNA extraction
	3.6 Clinical procedural skill

3.6 (a)	Examination of patient with hematological disorder
3.6 (b)	Administer basic chemotherapy under supervision
3.6 (c)	Bone marrow aspirate/ biopsy, therapeutic phlebotomy and lumbar puncture
	3.7 Transfusion Medicine
3.7 (a)	Blood grouping, DAT and IAT, Antibody identification and titre

3. ELIGIBILITY AND ADMISSION

The person applying for the DM course must be a postgraduate and the eligibility criterion is as follows:
Possession of MD/DNB in pathology from a university recognized by the Medical Council of India/NMC. Admission is through INI SS entrance examination conducted by AIIMS Delhi.

4. Duration of Program: 3 years

5. Syllabus

Semester 1

Core Topics:

1. Introduction to clinical haematology.
2. Introduction to Laboratory haematology.
3. Allied specialty

Subtopics:

1. Basic morphology and basic concepts of haematopoiesis.
2. Bone marrow structure and examination.
3. Red blood cells: Structure and function.
4. Laboratory approach to diagnosis of anaemia.
5. Development of Immune system.
6. Overview of normal haemostatic mechanism.
7. Laboratory approach to diagnosis of bleeding disorders.
8. Clinical evaluation and management of inherited bleeding disorders.
9. Laboratory approach to diagnosis of leukemias.
10. Laboratory methods in haematology
 - a. Principles of automated cell counter and interpretation of results.

- b. Hemoglobin electrophoresis.
- c. HPLC use in haematology.
- d. Special stains and cytochemistry.
- e. flow cytometry and its applications.
- f. Diagnostic procedures for analyzing DNA.
- 11. Principles of Nuclear Medicine: and applications in haematology & oncology.
- 12. Biostatistics.

Semester II

Core Topic: Disorders of Erythrocytes: (Part I)

Subtopics:

- 1. Iron metabolism and iron deficiency anaemia.
- 2. Megaloblastic anaemia.
- 3. Red cell membrane defect: hereditary spherocytosis.
- 4. Red cell enzymopathies.
- 5. Thalassemia: (a) clinical aspects and screening (b) molecular genetics.
- 6. Sickle cell anaemia.
- 7. Abnormal haemoglobins.
- 8. Immune haemolytic anemias.

Semester III

Core topics: Disorders of white cells (Part I)

Subtopics:

- 1. Cell Cycle and Carcinogenesis.
- 2. Principles of chemotherapy.
- 3. Quantitative defect of neutrophils.
- 4. Reactive lymphocytosis.
- 5. Introduction to acute leukemias.
- 6. Immunophenotype of acute leukemias.
- 7. Cytogenetics of acute leukemias.
- 8. Acute lymphoblastic leukaemia in children.
- 9. Acute lymphoblastic leukaemia in adults.
- 10. Acute myeloid leukaemia.

11. Acute promyelocytic leukaemia.
12. Minimal residual disease in acute leukaemia.
13. MRD genes in Leukaemia.
14. Chronic myeloid leukaemia.
15. Chronic lymphocytic leukaemia.
16. Hairy cell leukaemia.
17. T cell lymphoproliferative disorders.
18. Bone marrow transplantation.
19. Disorders of spleen.

Semester IV

Core Topics: Disorders of Hemostasis and Thrombosis

Subtopics:

1. Laboratory diagnosis of platelet function defects.
2. Overview of megakaryopoiesis.
3. Quantitative platelet disorders.
4. Qualitative platelet disorders.
5. ITP.
6. TTP/HUS.
7. Haemophilia
 - a. genetics; prenatal diagnosis.
 - b. Laboratory diagnosis.
 - c. Special management issues.
8. Von Willebrand's disease
 - a. Laboratory diagnosis.
 - b. Management.
9. Dysfibrinogenemias.
10. Other rare coagulation disorders.
11. Fibrinolysis and defects of fibrinolytic pathway.
12. Disseminated intravascular coagulation.
13. Lupus anticoagulant
 - a. Lab diagnosis.

b. Clinical presentation and management.

14. Acquired disorders of coagulation.

15. Hemostasis in the New-born.

16. Bleeding disorders in the New-born.

Semester V

Core Topic:

1. Disorders of haemostasis and thrombosis.

2. Disorders of erythrocytes Part II.

Subtopics:

Part A

1. Pathophysiology of thrombosis.

2. Inherited thrombotic disorders.

3. Laboratory testing of prothrombotic state.

4. Thrombosis in adults: Management issues.

5. Paediatric issues in thrombosis.

6. Thrombosis and pregnancy.

Part B

1. Bone marrow failure syndrome aplastic anaemia. Paroxysmal nocturnal hemoglobinuria.

2. Haematological manifestation syndrome disease.

3. Red cell disorders in pregnancy.

4. Red cell disorders in the new-born.

5. Polycythemia.

6. Infections and hematological problems.

Semester VI

Core Topic

1. Disorders of white cells Part II.

2. Miscellaneous topics

a. Transfusion medicine.

b. Immuno haematology.

c. Consultative haematology.

d. Quality assurance program.

Subtopics

Part A

1. Myelodysplastic syndrome.
2. Idiopathic myelofibrosis/essential thrombocythemia.
3. Non-Hodgkin's lymphoma.
4. Hodgkin disease.
5. Plasma cell disorders.
6. Histiocytosis.

Part B

1. Infections and blood transfusions.
2. Complications of blood transfusion.
3. Hematological manifestation of HIV.
4. Consultative haematology
 - a. Obstetrics and Gynaecology.
 - b. Surgery.
5. Blood and component therapy.
6. Blood safety programme.

PRACTICAL SYLLABUS

A. Laboratory Training

The training in haematology (24 months) is spread over a 3 year period. The training period is flexibly divided as follows:

i) Morphology and General Haematology

1. Proper use and care of common instruments such as light microscope, centrifuge, water baths, freezers, weighing balance, etc.
2. Weighing of solids, preparation of molar and N-solutions, preparations and use of buffers.
3. Blood collection samples-venepuncture and finger prick methods of sample collection, types of anticoagulants, containers and the effects of delay in processing and storage.
5. Use of automated blood cell counters including principles and practice. Interpretation of peripheral blood counts and abnormal flags.
6. Preparation of blood films and CSF, staining of peripheral/blood films and CSF cytospin slides with Romanowsky and other dyes.
7. Review of normal and abnormal blood films with emphasis on morphology of red cells, white cells and platelets.
8. Performance of WBC differential counts; subjective assessment of platelet counts and diagnostic interpretation of abnormal counts.

9. Preparation and staining of thick and thin blood films for malarial parasites.
10. Measurement and significance of ESR and plasma viscosity.
11. Supravital staining of reticulocytes, counting of reticulocytes.
12. Performance of bone marrow aspiration; trephine needle biopsy and lumbar puncture.
14. Preparation of smear of bone marrow aspirates and biopsy (touch) imprints. Staining and diagnostic evaluation of bone marrow aspirates.
15. Performance of sickling and solubility tests and screening for red cell G6 PD activity with interpretation of result.
16. Internal quality control monitoring of all the analysers and trouble shooting in case of IQC failure.

ii) Hemostasis and Thrombosis Laboratory

Platelets:

1. Performance of platelet count and study of platelet morphology.
2. Principles, practice and interpretation of platelet aggregometry tests.

Screening for coagulation factor abnormalities:

1. Prothrombin time.
2. Activated partial thromboplastin time.
3. Thrombin time.
4. Plasma fibrinogen.
5. Correction studies with normal plasma, adsorbed plasma, aged serum and factor deficiency plasmas.
6. D-Dimers.
7. Assays of clotting factors particularly factors VIII and IX.
8. Urea solubility test for factor XIII.
9. Inhibitor screen and Bethesda assay.
10. Work up for von Willebrand disease like vWF antigen, Ristocetin CoF, GpIb R.

Thrombophilia work up

1. Lupus anticoagulant testing
2. Protein C, S, AT, APCR

iii) Haemolytic Anaemia Laboratory

1. HB S solubility test and sickling test.
2. Screening for unstable hemoglobin, supravital staining of Hb H inclusion.

3. Principles and practice of separation and identification of normal and abnormal haemoglobins by chromatography HPLC/ Capillary zone electrophoresis.

4. Heinz body preparation.

5. Screening for G6PD deficiency and quantitative estimation of G6PD and other red cell enzymes.

6. Interpretation of miscellaneous hematological test on red cell, plasma and urine

i) Principle and procedures for estimation of plasma bilirubin and haptoglobin; and significance of the results, screening for methaemalbumin, methaemoglobin and sulphaehemoglobin.

ii) Screening for cryoglobins, principles of immunoglobulin estimation and immune electrophoresis.

iii) Estimation of urine for Hb, red cells hemosiderin, urobilinogen and bilirubin.

iv) Principles of estimation of serum ferritin and iron/TIBC.

v) Principles and estimation of red cell folate, serum folate and serum cobalamin.

iv) Leukaemia Work up and Flow cytometry

Morphology evaluation to diagnose various haematological malignancy.

Performance of the following staining procedures- Cytochemistry Sudan black, Myeloperoxidase, specific and non-specific esterase and iron staining.

Flow cytometric immunophenotyping studies for leukaemia diagnosis

Flow cytometry for various MRD detection

Application of flow cytometry in benign haematology- EMA, PNH, OFT, PID, Platelet flow cytometry etc.

v) Molecular Haematology:

PCR and its modifications

RqPCR for MRD

Prenatal testing for hemoglobinopathies

Sequencing studies for haematology disorders

v) Laboratory equipment and organization

A working knowledge of the mechanics of the various laboratories instruments including their operation, calibration and basic maintenance, is desirable.

1. Laboratory space distribution; ordering, siting and installation of laboratory equipment; workflow procedures and handling of samples.

2. Staffing-technical and non-technical.

3. Use of computers and generation of laboratory statistics.

4. Health and Safety measures (Physical/Chemical/Biological/Radiation).

5. Waste disposal.

6. Quality Assurance (Internal and External) measures.

7. Budgeting.

B. Clinical training

The training in clinical haematology is for 6 months (1st year - 3 month 2nd year - 3 months) at the clinical training has the following components.

i) Outpatient clinic.

ii) Haematology in patients services.

iii) Day Care Service.

iv) BMT

The objectives of this posting are similar to that of the training for DM clinical haematology. However, the resident undergoing clinical haematology posting as part of DM hemato- pathology is not expected to be on emergency call duty and inter departmental refereed services.

The competencies that a resident is expected to develop from the clinical haematology training include.

1. Ability to approach patient with haematology diseases.
2. Examination and plan work up of patients with haematological disorders in OPD.
3. Basic pathophysiologic mechanisms and therapy of disease of the blood including anemias, diseases of white cells, and disorders of haemostasis and thrombosis.
4. Etiology, epidemiology, natural history, diagnosis, and management of neoplastic disease, of the blood, blood-forming organs, and lymphatic tissue.
5. Effects of other systemic disorders on the blood, blood-forming organs and lymphatic tissue and management of the immunocompromised patients.
6. Genetic aspects of haematology.
7. Relevant drugs, their mechanisms of actions, pharmacokinetics and clinical indications Effects and toxicity.
8. Tests of haemostasis and thrombosis for both congenital and acquired disorders, and regulation of antithrombotic therapy.
9. Transfusion medicine, including the evaluation of antibodies, blood compatibility, and the use of blood-component therapy and apheresis.
10. They can start molecular studies and initiate Ante-natal diagnosis.
11. Bone Marrow Transplantation (3 weeks)

The resident must be familiar with current indications and results of bone marrow transplantation in various diseases.

- a) Donor selection
- b) HLA typing in bone marrow transplantation, screening of Donor.
- c) Conditioning regimens types

- d) The trainee must be familiar with the different conditioning regimens, principles of their use in different disorders and complications.
- e) Harvesting and manipulation of the bone marrow
- f) Bone marrow collection, red cell or plasma reduction, peripheral blood stem cell mobilization and collection, cryopreservation, Transfusion of marrow. Purging of marrow – T cell depletion.
- g) Transplantation immunology
- h) Histocompatibility, graft versus host disease – diagnosis and management, Immune reconstitution following transplantation.
- i) Management of post-transplant patient.
- j) The resident trainee will be hands on experience in tissue typing and will review the tissue typing results on patients and families evaluated for transplantation purposes. The trainee will also learn the practical aspects of flow cytometry.

Fellows are also expected to gain competence in the following **procedural skills**:

1. Bone marrow aspiration and biopsy.
2. Preparation and interpretation of films of blood and marrow.
3. Administration of chemotherapy.
4. Phlebotomy exchange transfusion.
5. Apheresis techniques.
6. Lumbar puncture with chemotherapy.

The resident in his/her 2nd year of training will be posted for a total of **6 months** in the following allied specialties for training.

i) Transfusion Medicine (2 weeks)

The resident will have hands on experience in practical blood banking. The trainee will be trained in the following aspects:

1. Blood donor management
2. Blood component preparation and their clinical use preparation of various components, packed red cells, fresh frozen plasma cryoprecipitates etc. Leukodepletion technique; irradiation of blood components
3. Blood processing and cross matching
 - ABO blood grouping/Rh typing
 - Antibody screening and classification
 - Cross matching
4. Transfusion transmitted infection screening

Screening for various infections

HIV, HbsAg, HCV, Syphilis, Malaria

Various methods, ELISA, Spot, Rapid, automated

ii) Histopathology lab (1.5 months)

The training will include familiarization with normal histology of Spleen, lymph node and thymus. Candidate must learn reporting of lymphomas inclusive of IHC interpretation for the same.

iii) Genetics lab for cytogenetics and FISH (4 weeks)

The training will include familiarization with cytogenetics, understanding the principles of cytogenetics and appreciating the relevance and significance of chromosomes in diagnostic haematology, interpreting the results of chromosome preparation of hemopoietic cells.

The training will also include general principles, specimen collection and preparation, karyotyping and fluorescence in situ hybridization (FISH) procedures and laboratory quality assurance measures.

iii) 3 months allied elective posting in other institutes if feasible.

6. Educational Program

A. DM HEMATOPATHOLOGY ROTATIONS:

	Lab Hematology	Clinical Hematology	Transfusion Medicine	Histopathology	Cytogenetic Lab	Elective Posting/Lab hematology
First Year	9 months	3 months				
Second Year	6 months	3 months	2 weeks	1.5 months	1 month	
Third Year	9 months					3 months

The training in hematopathology is of 3 years (36 months) duration. The training periods include **24 months in the haematology laboratory, 6 months in clinical haematology, 3 months rotation in allied specialty and 3 months elective posting or in hematopathology lab specific area of interest.**

6 (B) Teaching Activities: The weekly time table of teaching activities is given below:

Teaching Schedule

Sr. No.	Name of Activity	Frequency
1	Subject seminar	Once in 2 months
2	symposium	
3	Microteaching	
4	Journal club	
5	Interesting case presentation	
6	Debate	
7	Slide seminar	
8	Dissertation progress report	Once in 6 months
9	CPC with clinical haematology department	Once in a week
10	Clinical round in haematology ward to understand practical clinical approach to cases in ward rounds and also case presentations	Once in a week

DM resident will be actively involved in teaching MBBS students haematology topics and carrying out their internal assessment

They will assist faculty in organising Hematopathology teaching activities and slide seminar for MD Pathology students

LOG BOOK

The DM Hematopathology student shall maintain a log book of the work carried out by them and the training program undergone during the period of training including details of procedures assisted or done independently by the trainees. The log book shall be checked and assessed periodically by the faculty members imparting the training. Maintenance of performance record in log book is mandatory. Certified and assessed copy should be made available at the time of final practical examination for review by examiners.

6 (C) DM Dissertation:

Number: 1 dissertation to be presented

Activity	January admission	July admission
Selection of topic in consultation with PG Guide	March / April	September / October
Approval by Department PG Committee		
Institute Scientific Committee approval	May / June	November / December
Institute Ethics Committee approval		

Final approval letter by Academics Section	30th June	31st December
Final submission to academic section	30th June (Third Year)	31st December (Third Year)

6. ASSESMENT

A. FORMATIVE ASSESMENT:

- Evaluation of laboratory skills, academic performance and personal attributes will be an ongoing process. Periodic formative assessment will be done every 6 months and feedback will be given to trainee.
- The academic presentations shall be graded at the time of presentation by the faculty in-charge/HOD.
- Systematic theory and practical assessment will be done at the end of each year.

A 1. Six monthly Progress Report

The progress of the PG student will be monitored with the help of a six monthly structured report. (Annexure I) The report will contain details pertaining to attendance, teaching-learning activities, duties, teaching assignments, practical work, marks obtained at intermediate examinations, papers / posters presented, research publications and progress of dissertation work. The performance of the student will be graded by the PG Guide and the Head of the Department.

Timing for six monthly evaluations:

Report	July Session		January session	
	Period	To be submitted	Period	To be submitted
First	July to December	7th January	January to June	7th July
Second	January to June	7th July	July to December	7th January
Third	July to December	7th January	January to June	7th July
Fourth	January to June	7th July	July to December	7th January

Fifth	July to December	7th January	January to June	7th July
Sixth	January to June	10th June	July to December	10th December

A 2. Internal Assessment (600 Theory + 600 Practical = Total 1200 Marks)

Theory (500 Marks)

S.N.	Schedule	Marks	Pattern and Marks Distribution
1.	At end of First year	100	10 Short Questions x 10 Marks each (Total Duration 3 hrs.)
2.	At end of Second year	100	10 Short Questions x 10 Marks each (Total Duration 3 hrs.)
3.	Pre-professional	400 (4 Papers of 100 marks each)	As per Final Professional Examination
4.	Total	600 Marks	

Practical (500 Marks)

S.N.	Schedule	Marks	Pattern and Marks Distribution
1.	At end of First year	100	2 lab exercise x 25 Marks each (Total 50 marks) 25 for clinical haematology, 25 for viva voce 100
2.	At end of Second year	100	
3.	Pre-professional	400	As per Final Professional Examination
4.	Total	600	600 marks

Sr. No.	Eligibility for Professional/Summative assessment:
1.	Candidate should secure a minimum of 50% marks in Theory and Practical separately in internal assessments, in order to be eligible to appear for Professional Examination
2.	At least four out of six-monthly progress report should be satisfactory
3.	Minimum 80% attendance in each year of training.
4.	Acceptance of Dissertation is mandatory
5.	Successful completion of Research Methodology program at induction
6.	Minimum one scientific paper OR poster presentation at an international/national/state/zonal/regional conference / scientific society meetings.
7.	Minimum one scientific research paper – for publication/ accepted for publication / sent for publication in a peer-reviewed indexed scientific journal.

B. SUMMATIVE ASSESMENT:

Final Examination: Examination will be held at the end of having completed three years of supervised training

Theory					
	Paper I	Paper II	Paper III	Paper IV	Total
Maximum Marks	100	100	100	100	400
Marks Obtained					
Practical					
	Total Practical				Grand total
Maximum Marks	400				800
Marks Obtained					

7 B 1 Theory:

Three papers each of 3 hours duration and 100 marks each. (Total 300 marks) would be given. They would include 2 long and 6 short essays.

Paper	Title	Marks	Marks Distribution
Paper I	Basic & applied Haematology	100	2 long answer Question 20X2= 40 Marks 6 Short Answer Question: 10 X 6 =60 Marks
Paper II:	Diagnostic Haematopathology-I	100	
Paper III:	Diagnostic Haematopathology and Quality control -II	100	
Paper IV:	Recent advances Hematology	100	
	Total	400	

7 B.2 Practical: The practical examination should consist of the following

	Subjects	Content	Marks Distribution	Total Marks
A.	Laboratory Haematology	Morphology	150	300
		Long exercise	60	
		Short exercise	40	
		Spots-Data analysis	50	
B.	Clinical Haematology	Two short cases	20	50
		Case exercise	10	
		Spotters Clinical	20	
C.	Viva-voce examination	1. Viva on various topics related to Haematology and recent advance 2. Research methodology, thesis, logbook evaluation and medical ethics.	50	50
			Total	400

Note:

(A) Minimum 40% marks in each paper and aggregate of 50% marks in order to be declared pass in theory exam

(B) Minimum 50% marks required in Theory & Practical separately, in order to be declared successful in summative exam

6. Recommended Reading:

Trainee should make use of the learning resources in both offline and online mode including but not limited to the list given below:

Recommended Text Books:
• WHO classification of tumours of hematopoietic and lymphoid tissues (latest edition) • Wintrobe's clinical Haematology (Latest edition) • Dacie and Lewis practical Haematology (Latest edition) • Bone marrow pathology- Barbara Bain (Willey Blackwell) • Hemoglobinopathy Diagnosis-Barbara J Bain (Latest edition) • Haematology basic principles and practice -Ronald Hoffman (Elsevier) • Bone marrow pathology- Kathryn Foucar (American society of clinical Pathology) • Flow cytometry in Neoplastic haematology Morphologic -Immunophenotypic- Genetic correlation - Wojciech Gorczyca (Latest edition) • Molecular Haematology - Drew Provan (Wiley Blackwell) • Modern Blood banking and transfusion practices- Denise M Harmening (Latest edition)
Recommended Journals:
International Journals • American Journal of Haematology • British Journal of Haematology • Blood • Blood advances • Journal of thrombosis and haemostasis

- Journal of coagulation and fibrinolysis
- Cytometry Part B: Clinical cytometry
- International journal of Laboratory Haematology
- Turkish Journal of Haematology

National Journals

- Indian journal of haematology and blood transfusion
- Indian journal of pathology and microbiology
- Journal of laboratory physicians

Latest guidelines, recommendations and resource material available online from following websites:

- American society of Hematology(www.hematology.org)
- International society of thrombosis and hemostasis (www.isth.org)
- World federation of hemophilia (wfh.org)
- International society of thrombosis and hemaostasis (www.isth.org)
- International clinical cytometry society (www.cytometry.org)