Criteria for Admission, Examination Scheme and

Outline of syllabus

For

Diploma in Medical Laboratory Technology(DMLT)

(Recognised by Govt. of NCT of Delhi, Deptt of Health & Family Welfare No. F.3(4)/PHC/TRC/2007/2815-21)

INDIAN MEDICAL ASSOCIATION
IMA HOUSE, I.P. MARG
NEW DELHI – 110 002
Ph:2337 0009, 2337 8819, 2337 8424

ELIGIBILITY

1) Candidates who have passed 10 + 2 from any Board/ CBSE/ ICSE board or Pre-University examination with 40 % percent marks with science stream (Physics, Chemistry, Biology, Mathematics, Agriculture, etc.).

2) If science candidates are not available then the institutes may enrol students from any other stream with minimum of 50% of aggregate marks with an under taking/Affidavit from the students that they are fully aware that the Diploma may not be recognised by some of the State Governments and that they are undergoing the training on their own risk and will. Such an undertaking/Affidavit will have to be submitted to IMA at the time of enrolment of the candidates.

3) A candidate seeking admission to Diploma in Medical Laboratory Technology (DMLT) course should have 17 years of age, as on 31st, December of the year of admission. The candidate seeking admission in to Diploma courses should have attained 17 years of age as on 31ST December of the year of admission but not more than 25 years at the time of admission. Age relaxation of 5 years for SC/ST candidates and 3 years for OBC candidates is admissible.

DURATION OF THE COURSE

The duration of the DMLT Courses shall be Two Years and there is no internship programme.

MEDIUM OF INSTRUCTION

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

ATTENDANCE

A candidate is required to attend at least 75 percent of total classes conducted in year in all subjects prescribed for the year, separately, in theory and practical/clinical postings to become eligible to appear for the Institute examination. The Principals should notify at their college the attendance details at the end of each term without fail, under intimation to the Institute.

SCHEDULE OF EXAMINATION

There will be two examination in a year, **I) July and ii) November**. Examination to be conducted as per notification issued by the Institute from time to time.

EXAMINATION

There will be 3 Theory papers as under: -

1. **Paper – I :** Haematology, Blood Bank Techniques and Immunology

   Paper-II :Clinical Chemistry, Bio- Chemistry, Serology and Urine analysis

   Paper-III :Bacteriology, Parasitology and Elementary Histopathology.

2. The stress should be on techniques and skills
3. There should be Six Questions in each paper.

TUTION FEE including Admission Fee (Excluding Enrolment & Examination Fee) is Rs. 30,000/- per year. Rs. 2000/- Registration Fee and Rs. 3000/- Examination Fee per candidate.

CRITERIA FOR PASSING

A candidate is declared passed in an examination in a subject, if he/she secures 40% of marks in theory and 40% in practical separately, will be placed in division as under :

i) 75% : Distinction
ii) 60-74.9% : I st Division
iii) 50- 59.9 % : 2nd Division
iii) 40-49.9% : Pass

SUPPLEMENTARY EXAM : Candidate failing may take up supplementary examination to be held after 6 months.

GOVERNING BODY

This will be the monitoring and governing body to run the course and to look after its different facets so that the course run by it is lucrative and useful in producing trained medical personnel's who are useful to the laboratories and who may earn livelihood by getting employment in prestigious laboratories.

Board will consist of :

1. Chief Coordinator of Medical Laboratory Technology - 1

2. Coordinators – 4
   a. From IMA Hq.
   b. One retired / senior pathologist
   c. One retired microbiologist
   d. One retired biochemist

IMA President and Hony. Secretary General or their nominee will be permanent participant having voting power. Tenure of board should be two years.

PAPER I

Haematology, Blood Bank Techniques Immunology and Serology

(A) HAEMATOLOGY (THEORY)

1. E.S.R. Principles – normals and interpretation Various Methods – Demonstration.
2.
3. Hemoglobin – formation fate and functions; Normal ranges, physiological and pathological variations
4. Various principals for methods in Hemoglobinometry; Standardisation.
5. Interpretation of TLC & DLC. Leukocytosis, Physiological and Pathological, Arneth and setilling counts, Leukopenia, eosinophilia, lymphocytosis,
6. Anaemia, R.B.C., morphology, normal and abnormal – hypochromia, anciocytosis, polychromasia, Cabot Rings, Basophilic, Stippling, Reticulocyte.
7. The Hematocrit – macro and micro methods; Hematocrit ratio to Hb, Erythrocytic indices, Interpretation.
   Demonstration of Micohematocrit
8. Origin, formation and fate of Blood cells, Theories of Blood cell formation. Bone Marrow sites.
9. Maturation of Blood cells – myeloid series.
10. Maturation of Blood cells – lymphocyte and monocytic series and megakaryocytic series.
11. Maturation of Erythrocytic series – Normoblastic and megaloblastic maturation.
12. Theory of Blood coagulation. Factors involved. Extrinsic and Intrinsic Pathway. Cascade Theory.
13. Various sample tests – Dike and lvy method
    a/ Bleeding Time – Dike and lvy method
    b/ Coagulation Time – Lee White Capillary and Slidy Method
    c/ Prothrombin Time – 1 stage and 2 stage
    d/ Clot Retraction
    e/ Platlet Count
    f/ Thrombin Time
    g/ Partial Thrombopllastic Time
    h/ F.D.P.

13 Principle, interpretations and demonstrations

14 Recticulocyte count – various methods
   Interpretations and Demonstration

15 L.E. Principle – various methods. ANF Test. Demonstration

16 PMNS smear, Filariall preparation, eosinophil count principle, interpretation and source of error.

17 Hemoglobins – structure in detail, formations fate, abnormal Hemoglobins, methods of study – Sickle Test, Eb, electrophorosis test. Demonstration.
18 Iron Metabolism
19 Classification of anaemias and mircrocytic (Iron Deficiency) anemia.
20 Macrocytic anaemias including Pernicious Anaemia – causes, Lab. Findings.
21 Hemolytic anaemias – Classification, Gen. Lab. findings.
a/ Congential anaemias. Spherocytic anaemia, Osmotic fragililty.
b/ Acquired hemolytic anaemias. Drug induced.
c/ Hemoglobinepathies, Sickle cell Hb.C. Thallesemia.
d/ P N H and cold hemolytic anaemia.
e/ Enzyme deficiencies including tests.
22 Aplastic anaemia, myelofgibrosis
23 Polycythemia, Leukemias – acute and chronic
24 Purpores and Hemorrhagic disease, Hemophilia
25 Bone marrow aspiration. Staining and differential and reporting.
26 Demonstration of Bone Marrow pictures.

(B) BLOOD BANK (THEORY)

1. ABO System, antigens sub-groups of A Bombay O. Antibodies of ABO systems. Nature of antibodies. Anti A.B. Anti H.
2. ABO testing slide and tube test. Reverse grouping. Discrepancies between cell and serum results, sources of error. Rouleux formation and methods of checking this.
3. Rh system. Nomenclature, Due system and its significance, nature of Rh antibodies. Clinical significance phenotype and genotype.
4. Rh grouping test. Slide or Rapid Tube Test. False positive and false negative results.
5. Cross matching of Blood. Principles, Reasons for X match. Saline albumin, Coombs, Enzymes in testing.
6. Labelling of tubes, Methodology, legal implications, Incompatible Crossmatch. Auto antibodies, plasma expanders, multiple myeloma etc. affecting a X-match. Difficulties in X- matching, and methods of investigations.
7. Anticogulants for blood preservation, ACD, CPD, CPD A-1. Heparin advantages and Disadvantages. Shelf life of blood Changes taking place in blood on storage, Na, K etc.
8. Reception of donors, indirect questioning of eliciting medical history. Types of donors, Rejection of donors in certain diseases and history of diseases. Physical examination of donor and test done on donor's blood for safe transfusion of blood. Technique and importance of sterile technique in drawing blood.
9. Various donor reactions and their remedies. Facts of blood donations, precautions and care to be taken during and after blood donation. Need of giving refreshments to the donor. Emergency kit.
10. Coombs Test – Direct and Indirect. Principle, explanation of procedure and sources of error. Control, interpretation and clinical application. Different types of coombs's sera.
11. Transfusion reactions. Handing of Transfusion Reactions in B.B.
12. Demonstration of Coombs Tests – Direct and Indirect
13. Hemolytic disease of the new born due to anti – D or ABO. Mechanism of the disease. Blood for exchange and tests done on cord blood.
14. Other blood group systems. Kell Duffy, Mns and its importance. H.L.A. system, Enzymes in Blood Banking. Use of LISS.
15. Antibody Titrations, reasons and methodology.
16. Blood Component Therapy.

(C) IMMUNOLOGY AND SEROLOGY (THEORY)

1. Definition of Immunity and the immune system of the body immune responses. Basic definitions
2. Basic aspects of the immune response.
   a/ Humoral division
   b/ Cellular division
3. Antigens and heptens. Types of antigen. Types of immunization Heterophile antigens, Alloantigens.
4. Basic Structure, biological properties of immunoglobulins complement.
5. Methods of detection and measurement of antibody and antigen:
   a/ Preceipitation
   b/ Ring test (original C Reactive Protein)
   c/ Gel – Immune diffusion. Single and double immuno-diffusion.
6. Redial Immunodiffusion, counter immuno-electrophoresis Agglutination test. Direct agglutination, Titration, Prozone reaction fibrile agglutinins.
7. Slide agglutination and tube agglutination Widal tests, complement fixation test – principle Immunoflourescence test.
   Principle and interpretation of various, immunological tests done by the Laboratory.
8. Pregnancy test, (including the historical background and Bioassays). A S O, CRP, RP, ANF and autoimmune disorder, Wider VDRL (Kahn, was erman's test TPI, TPI, RPCF, FLA, ABS).
9. EIA and RIA – Principle; Viral Hepatitis and the markers.
10. Syphilitic Serology – Kahn, VDRL, RPR.
11. Indirect of passive agglutination
    a/ using RBC as carriers (Coated RBC) Pregnancy tests HBs Ag.
    b/ Latex coated particles fixation, Bentonite, Rheumatoid factor;
    Pregnancy latest (Gravindex) pregtel ASL and CRPA.
12. Complement fixation tests and Casserman Reaction
13. Immune Flurescence tests
    Fluorescent labeled antibody techniques.
    F.T.A. for syphilis.
    ANA or ANF tests for L.E.
14. Auto Immunity auto immune disease LE cell ANA or ANF
15. Hypogammaglobunemia
16. Hypergammaglobunemia Cryoglobunemia
17. Organ transplantation

PAPER II.

Clinical Chemistry/ Biochemistry and Urine Analysis

(A) CLINICAL CHEMISTRY/ BIOCHEMISTRY (THEORY)

1. Principles in brief of the various methodologies.
2. One or two common methods in detail – principle, brief procedure, Reagent ingredients and functions sources of errors and precautions and standardization.
3. Brief Metabolism and Clinical Interpretation.
4. One Lecture – care and precautions, in general, to be used in Biochemical testing.
5. Urea Methods:
   a/ Diacetyl Monoxime
   b/ Bertholets
6. Bilirubin:
   a/ Mallery Evlem
   b/ Jendrassk and gruff
7. Neonatal jaundice and direct spectrophotometric method of Bilirub in estimation Advantages and Disadvantages.
8. Creatinine
9. Enzymes – genera considerations, units of measurement, Factors effecting and types of assays.
10. Amylase caraways method
11. Protein free filtrates
12. Creatinine estimation – Jaffe's reaction
13. Calcium
14. CSF. Physical, chemical and cytological examination methods and procedures used and clinical interpretes.
15. Revision of the Basic concepts in Biochemistry, atomic and molecular symbols and formulae; various types of solutions, Molar, Normal definitions and calculations; various types of chemicals.
16. SGOT & SGPT – Reitman frankel method
17. Alk P'tase. BLB method
18. Acid P'tase BLB method
19. Serum proteins. Total protein by Biuret method and Albumin by BCG method
20. Review of Beer34's Law and Spectro photometry.
21. Principles of spectrophotometry and use of flame Photometer.
    Estimation of :
    a/ Na^+
    b/ K^+
    c/ Cl
    d/ HCO_3

22 Lipid metabolism and estimation
a/ Cholesterol
b/ HDL Cholesterol
c/ Triglycerides
d/ Total Lipids.

23 Fractional test meal and analysis of gastric contents. Augmented histammic test. Hallenders test.

24 Transudetes and exudates; Phosporus.

25 Quality Control

26 Acid, Base, PH, Indicators, Buffers.

27 Electrolytes, Acid, Base and Water balance

28 Primary and Secondary standards.

29 Revies of :
a. Carbohydrate
b. G.T.T. and metabolism, intermediary metabolism and Ketoris
c. Urea metabolism and Kidney function test.
d. Billirubin metabolism and liver functions test.
e. Calcium and Phosphorus metabolism.
f. Proteins metabolism and electrophoresis

30 Brief understanding of :
a/ T_3 T_4 TSH
b/ CPK
c/ VMA
d/ Cortisols
e/ Estrogen Progesteron
f/ Hormones

31 Introduction to automation in clinical chemistry, Basic concepts, types of analysers.

(B) URINE ANALYSIS (THEORY)

1. Physical and Chemical examination of urine by strip – appearance colour specific gravity pH Alb. Sugar.
2. Demonstration of technique; Chemical examination of urine by other methods. Albumin Sulfosalyclic acid method; Glucose – Benedict's method.
3. Urinary sediments – Methods of obtaining sediment; Organic and Inorganic sediments: normal and abnormal sediments.
4. Principles of Albumin tests with interpretation. 24 – hour semiquantitative test for albumin; Bence Jones protein methodology.
5. Principle of tests for glucose in urine – various methods.
6. Bile pigments and urobilinogen in urine; Principle and various methods; Demonstration of Harrson's Spot Test; Metabolism of bile pigments; Interpretation.
7. Watson's semiquantitative test and tests for Porphobilinogen; Demonstration of techniques.
8. Porphyrine in urine – various tests; clinical significance; Demonstration of techniques.
9. Ketone bodies in urine – principles and interpretation; Demonstration of techniques.
10. Occult Blood in urine; principles, various methods; sources of error; Demonstration of technique.
11. Semen analysis; reasons for it and interpretation.
12. Urine calculi; reasons for formation; clinical significance; Demonstration of technique and test.
13. Semiquantitative and 24 – hours tests for urinary calcium (Sulkowitch) and chloride (Fantu's); Demonstration of technique.
14. Tests for Melanin, Indian PKU, Homogentisic acid; Demonstration of technique.
15. Renal Function Tests – principle of concentration and dilution tests P.S.P. Dye Test.
16. Addis Count – Various preservatives for 24 – hours samples of urine, volume of urine in 24 – hours; change in urine on standing.

PAPER III.

Bacteriology, Parasitology and Elementary Histopathology

(A) BACTERIOLOGY (THEORY)

1. Structure and Biology bacteria; respiration; reproduction, nutrition and growth.
2. Methods of sterilization with equipment used:
   a/ Physical
   b/ Chemical
   c/ Irradication, etc.
3. Basic constituents of culture media; various types of culture media; Liquid and solid media; Semisolid media – differential, selective, enriched.
4. Methods of inoculation and streaking liquid; semisolid and plates aerobic and aerobic methods of culture.
5. Review Gram's and AFB staining methods and capsular and Albert's stain; demonstration in all of these to be taken regularly in the Ist month.
6. Gram +ve Staphylococcus. Catalase and coagulase tests.
7. Streptococci, Pneumoccus, bacitracin test, optochin and Bile solubility tests.
8. Neisseria
9. Enterobacteriacae with classification, Code I, Code II, Metilities full code.
10. E Coli, Klebsiella and Enterbacter.
11. Edwardsiella, Alkalescens dispar, serratia and Hafnia with Gillies code.
12. Pseudomonas, Aeromonas, Mimae, Alkaligenes.
13. Proteus, Providence.
14. Salmonella, Citrobacter, Arizina.
15. Shigella
16. Vibrios, Hanging drop
17. Non- intestinal gram negative bacteria; Hemophilus, Brucella; Pasterueulle, Bordetella; Bacterioides.
18. Gram positive bacteria – (Corynebacteria; Listeria; Chosticia); Bacillus species
19. Spirochetes and Spirillum
20. Mycobacteria
21. Virus Rickersia
22. Fungus
23. Normal flora of various areas in the body
24. Chemical disinfectants and methods of study of disinfectants.
25. Antibiotics and sensitivity.

(B) PARASITOLOGY (THEORY)

1. Protozon classification and general morphology.
2. E.Coli, E. Histolytica and other Rhizopodia.
3. Flagelattes ex. Trichomonas, Giardia intestinalis, etc.
4. Malaria Parasites, Life cycle – various stages.
5. Hemoglagellates, Trypanosomes Leishmania.
6. Nematode classification; Trichnella spiralis; Trichuris; Trichura.
7. Round Worms and Pin Worm.
8. Hook Worms and Strongyloides
9. Platyheliminths – classification and names with general outline.
10. Tenia Saginata; T. Solium; H.Nana
11. Echinococcus Granulosus; D. Latum.
12. Tissue Nematodes; Wuchcheria Bancrofti Brugia; loa loa.
13. Onchocera; Dracunculose medinesis.
14. Methods of Examination of Stool for Parasities and for Protozoa.

(C) ELEMENTARY HISTOPATHOLOGY (THEORY)

1. Introduction to Histopathology sources and types of Histopathological specimens received, records, labeling and general rules when receiving a specimen.
2. Fixation, properties of fixing fluids, Classification of fixatives, simple fixatives and compound fixatives.
3. Dacalcification
4. Processing – Dehydration, Principle. Various clearing agents, advantages and disadvantages of each.
5. Processing Count, Clearing, Principle. Various clearing agents, advantages and disadvantages of each.
6. Impregnation with paraffin. Type of paraffin. Advantages and Disadvantages.
7. Embedding and Blocking.
8. Impregnation; embedding and blocking with various water soluble masses.
9. Various equipments and methods used in History for processing, Histokinette etc.
10. Microtomes and Knaves, Care
11. Hones, strops, homing and stropping, methodology and checking the results attaching blocks to carriers.
12. Cutting and sectioning knife angle. Errors in sectioning and their remedies.
13. Separating and identifying sections.
14. Decalfication of Stains, types of stains, mordents and differentiations.
15. Separating and identifying sections.
16. H & E staining methods and principles involved in staining.
17. Papanicoau staining.
18. Skeletal system – various bones, joints Bone Marrow, face bones, skull, vertebrate, ribs, pelvis, Limbs.
19. Joints – movable and immovable.
20. Muscular System, Muscles, tendons, ligaments, diaphragm.
21. Circulatory System, Heart, great blood vessels, arterial and veinous system, capillaries, foetal circulation.
22. Lymphatic system.
23. Respiratory system
24. Digestive System
25. Nervous System
26. Endocrine system
