

# **Certificate in BLOOD BANK TECHNOLOGY**



**INDIAN MEDICAL ASSOCIATION  
IMA House, I. P. Marg  
NEW DELHI**

## **Syllabus of “Certificate in Blood Bank Technology” (CBBT)**

“Certificate in Blood Bank Technology” will be one year post DMLT certificate Course. The students will study four papers I, II, III and IV and practicals based on these papers. The teaching per week will be 16 hours for four papers and 16 hours practicals. The total marks of all the four theory papers will be 400 and 200 marks for practical examination.

**Eligibility Criteria:** DMLT, B.Sc MLT, B.Sc(Micro)

**Age :**

- 1) The candidate seeking admission in to Diploma courses should have attained 17 years of age as on 31<sup>ST</sup> 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.
- 2) For certificate courses there shall be no upper age limit.

**Rules for passing the Examination :** To pass the examination, a candidate shall be required to obtain atleast 40% of the marks obtainable separately in (e) each theory paper and (b) practicals including Viva-Voce.

**Passing Criteria :** A candidate is declared passed in an examination in a subject, if he/she secures 40% of marks in theory and 60% in practical separately, will be placed in division as under :

- i) 75% : Distinction
- ii) 60-74.9% : Ist Division
- iii) 50- 59.9 % : 2<sup>nd</sup> Division
- iv) 40 to 49.9% : Pass

**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.**

## **Paper I**

### **Section One: Immunohaematology**

1. Basic Principles of immunohaematology, Application of Blood groups: Population Genetics, Transfusion medicine
2. ABO Blood of Group Systems: History, Genetics, ABH antigens, Biochemical Synthesis of blood group antigens, Antigenic sites, weaker variants, Bombay Phenotype, ABO antibodies
3. Rh Blood Group System: History, Genetics, Molecular Genetics, Nature of Rh Antigens, Partial D, Weak D, other variants of Rh, Rh Null, Rh antibodies, factors influencing Rh immunization, Functional role of Rh antigens
4. Other Blood Group Systems: Lewis, P, Ii, MNSs, Kell, Duffy, Kidd & others
5. Hemolytic disease of the newborn due to ABO Incompatibility, Rh Incompatibility and other allo-antibodies
6. Red cell serology techniques, their advantages and disadvantages, Cell and serum grouping, detection of weak A and B antigens and weak D/Partial D cases, Trouble shooting in red cell serology
7. Compatibility Different methods of cross matching, cross matching in special circumstances, emergency cross matching, electronic cross matching
8. Principles of Direct and indirect antiglobulin test, enzyme technique, albumins technique, Detection of blood group antibodies, identification of their Specificity, clinical significance of antibody detection, differentiation between auto and allo-antibodies.
9. Gel Technology, Microplate technique

### **Section Two: Hematology**

1. Collection of blood samples, types of anticoagulants
2. Complete hemogram, Different methods of hemoglobin estimation: specific gravity method (Copper sulphate), Sahli's (Cyanmethemoglobin) and Hemo-Q methods, hematology analyzers
3. Normal erythropoiesis, Leucopoiesis, thrombocytopoiesis of platelets, calory metric Method
4. Classification of anemia, their laboratory diagnosis, Hemoglobinopathies: Beta Thalassemia and Sickle cell disease, G6PD deficiency, polycythemia
5. Autoimmune hemolytic anemia, classification, diagnosis, specificity of autoantibodies
6. Coagulation Mechanism, Hemostasis, laboratory tests for Hemophilia A & B, Platelet Disorders
7. Hematological malignancies, Leukemia and Lymphoma
8. Bone marrow transplantation, peripheral stem cells, cord blood stem cells, cord blood Banking
9. Forward and reverse grouping.

## Reference Books

1. Blood transfusion clinical medicine. PL Mollison CP Engelfriet and Marcela Contreras. 11<sup>th</sup> ed. Blackwell Science, London.
2. Rossi principle of Transfusion Medicine, 4<sup>th</sup> edition
3. AABB Technical Manual, 16<sup>th</sup> ed, AABB, USA, 1996.
4. Modern Blood Banking and Transfusion practices. Denise M Harmening, 5<sup>th</sup> edition
5. Transfusion Medicine technical manual. Director General of Health Services, Ministry of Health and Family Welfare, Govt. of India, Second edition, 2003.
6. Recent trends in transfusion medicine. Snehalata C. Gupte, PK Desai, SRKRC Publication, 2002.
7. Immunohematology: Principles and Practice by ED Quinley (1998)
8. Compendium of transfusion medicine, RN Makroo, Alps printer, 1999.
9. Hematology today. M. B. Agrawal, Ashirwad haematology centre, Mumbai, 2009.

## Practicals based on Paper I

1. ABO grouping and Rh types by tube method
2. Preparation LISS.
3. Preparation of Papain cystein.
4. Major and minor cross-matching.
5. Direct and Indirect antiglobulin method.
6. Rh typing by indirect antiglobulin method.
7. Anti-A, anti-B and anti-D titre saline phase.
8. Gel technology of blood grouping and compatibility testing.
9. Investigations of haemolytic transfusion reaction.
10. Different methods of Detection of blood group antibodies.
11. Identification of blood group antibodies
12. Hemoglobin estimation by Cyanmethhemoglobin method
13. Preparation of Copper Sulphate solution.
14. Hb estimation on Hematology Analyser.
15. Total RBC and WBC count.
16. Differential leucocytic count and examination of blood smear.
17. Platelet count.
18. Reticulocyte count.
19. Hb electrophoresis.

## **Paper II**

### **Section One: General Immunology**

1. Introduction to Immunology, History, Immunity
2. Antigens : Immunogen, allo-antigen, soluble antigen, Red cell antigen, Epitopes
3. Antibodies: Polyclonal antibodies, development of antibodies, structure of immunoglobulins, characteristics of immunoglobulins
4. Monoclonal antibodies: Hybridoma technology, Human monoclonal antibodies, Applications of MAb
5. Antigen antibody reaction: Antigen concentration, antibody concentration, enhancing media, other factors influencing antigen antibody reaction, Immunoassays: ELISA, IRMA RIA ??
6. Cells of immune system: Phagocytic cells, Antigen presenting cells, T cells, T cell subsets, B cells, CD Markers, Flow cytometry for counting T & B cells
7. Autoimmune disorders, their mechanisms
8. Complement System
9. HLA antigens, HLA antibodies, HLA Serology, Histocompatibility matching: Molecular methods

## **Paper II**

### **Section two: Microbiology & Biochemistry**

1. Introduction to Microbiology, Fundamentals of microscopy, sterilization and disinfection
2. Groups of Micro organisms, Micro organisms staining techniques
3. Transfusion transmitted infections, HIV (1+2), HCV, HBV, malaria, syphilis
4. New emerging Blood transmitted pathogens
5. ELISA, rapid and other tests for diagnosis of transfusion transmitted infections
6. Biosafety, Management of Biomedical waste and universal precautions.
7. Introduction to Biochemistry, Acid and Base, Buffers and Buffer action, pH, The Beer & Lampard Law & its application

## Reference Books

1. Basic Immunology, A K Abbas and A H Lichtman. Second ed, Saunders Elsevier, 2006.
2. Essential Immunology. I Roitt, 8<sup>th</sup> ed, Blackwell scientific publications, London, 1994.
3. Immunology: The immune system in health and diseases. CA Janeway, P Travers, 3<sup>rd</sup> ed, Current Biology Ltd, London, 1997.
4. The immune system. I McConnell, A Munro, H Waldmann 2<sup>nd</sup> ed, Blackwell Scientific publications.
5. Monoclonal antibodies. PCL Beverley, Churchill Livingstone, London, 1986.
6. General Microbiology, Roger Y. Stanier, Edward A. Adelberg and John L. Ingraham, 4<sup>th</sup> ed., Prentice Hall Inc.
7. Fundamentals of Microbiology, Frobisher, Hinsdill, Crabtree and Goodheart, 9<sup>th</sup> ed., W. B. Saunders Company.
8. Diagnostic Microbiology, Finegold and Martin, 6<sup>th</sup> ed., The C. V. Mosby Co.,
9. Bailey and Scott's Diagnostic Microbiology, Sydney M. Finegold and Eelln Jo Baron, 7<sup>th</sup> ed., the C. V. Mosbey Co.,
10. Practical Medical Microbiology, Collee Duguid, Fraser, Marmion, 24<sup>th</sup> ed., Churchill Livingstone.
11. Outlines of Biochemistry. Elonn K Stumpt, G Bruency and H Dol, John Weiley and Co., 5<sup>th</sup> ed.
12. Practical Clinical Biochemistry, H. Varley, 4<sup>th</sup> ed, CBS Publishers.

## Practicals based on Paper II

### Immunology

1. Rapid tests for HBsAg detection.
2. ELISA for HBsAg detection.
3. HCV antibody detection by Rapid tests.
4. HCV antibody detection by ELISA.
5. HIV (1+2) antibody detection by Rapid Tests.
6. HIV (1+2) antibody detection by ELISA.
7. VDRL test for Syphilis.
8. RPR/TPHA test for Syphilis.
9. Malaria Parasite detection: Slide Method.
10. Malaria Parasite antigen detection test: Rapid Method.
11. Cleaning neutralization and preparation of glassware for sterilization.
12. The Gram Stain.
13. The Acid fast Bacillus (2N Stain).
14. Staining for cell structure of organism.
15. Bilirubin estimation.
16. Serum Iron and TIBC estimation.?
17. Serum ferritin estimation.?

## **Paper III**

### **Section One: Blood Banking: Blood Donation**

1. Donor Motivation, Motivational Techniques, Social Marketing, Preparation of IEC Materials
2. Donor recruitment & Retention: Types of blood donors, Donor selection, medical interview and medical examination, screening for hemoglobin estimation, Managing rejected blood donors, technique for conversion of first time donor into regular voluntary donor, donor recognition.
3. Phlebotomy room equipment, their principles, and use, emergency medicines, Pre and post donation screening counseling, Bleeding of the donor, post donation care.
4. Screening of blood units for mandatory tests.
5. Blood Donation drive: Awareness programs prior to Donation drive, Camp site, staff requirement, management of camp, transportation of blood units from camp site to blood bank
6. Preservation of donated blood, blood preservation solutions, Additive solutions
7. Apheresis procedures, Apheresis products, preparation of multiple products on cell separators, Maintenance of cell separator equipment
8. Autologous blood donation, techniques of donor blood collection
9. Discarding of infected and outdated blood

### **Section Two: Blood Banking: Blood Components**

1. Selection of donor or component separation
2. Selection of blood bags for component preparation
3. Blood component preparation: preparation of red cell concentrate, Fresh Frozen plasma, platelet concentrate, cryoprecipitate, washed red cells, Frozen red cells
4. Plasma Fractionation: Principles, manufacturing of different plasma derivatives
5. Component Testing, Labeling,
6. Transportation and storage of blood components
7. Preparation of leukoreduced blood products, Leukocyte filters, component extractors
8. Metabolic changes in blood components during storage, release of cytokine during storage
9. Inventory management and maintenance of blood stock.
10. Irradiated blood components
11. Blood substitutes

## Reference Books

1. Voluntary blood donation program NACO, Ministry of Health and Family Welfare, Govt. of India, New Delhi, 2007.
2. National guide book in blood donor motivation. NACO, Ministry of Health and Family Welfare, Govt. of India.
3. Blood transfusion clinical medicine. PL Mollison CP Engelfriet and Marcela Contreras. 11<sup>th</sup> ed. Blackwell Science, London.
4. AABB Technical Manual, 16<sup>th</sup> ed, AABB, USA
5. Modern Blood Banking and Transfusion practices. Denise M Harmening, 5<sup>th</sup> edition
6. Transfusion Medicine technical manual. Director General of Health Services, Ministry of Health and Family Welfare, Govt. of India, Second edition, 2003.
7. Recent trends in transfusion medicine. Snehalata C. Gupte, PK Desai, SRKRC Publication, 2002.
8. Compendium of transfusion medicine, RN Makroo, Alps printer, 1999.

## Practicals based on Paper III

1. Blood Collection procedure.
2. Bleeding of the blood donor.
3. Operation of blood collection monitor, tube sealer and needle burner.
4. Platelet pheresis on cell separator.
5. Preparation of red cell concentrate and fresh frozen plasma.
6. Preparation of washed red blood cells.
7. Preparation of platelet concentrates by PRP method.
8. Preparation of platelet concentrates by buffy coat method.
9. Blood component preparation on component extractor.
10. Preparation of leukoreduced platelets using leukocyte filter.
11. Testing of haematological parameters of blood products.
12. Measurement of factor VIII level in FFP
13. Measurement of fibrinogen level in FFP
14. Sterility test on platelet concentrates.
15. Sterility test on Whole blood
16. Measurement of pH and other platelet parameters.



## **Paper IV**

### **Section One: Transfusion Therapy**

1. Management of Blood Bank Counter, Criteria for acceptance of requisition form inspection of blood component prior to issue.
2. Blood administration, transfusion filters, post transfusion care, Therapeutic plasma exchange
3. Judicious use of blood; management of different types of anemia, management of bleeding patient, Neonatal transfusion, Transfusion practices in surgery, Transfusion therapy for oncology and transplantation patients.
4. Hemolytic transfusion reaction immediate and delayed; immune and non immune reaction pathophysiology; Clinical signs and symptoms Laboratory investigation for HTR Tests to detect bacterial Contamination in blood,
5. Non hemolytic transfusion reactions Immediate and delayed, febrile reaction, allergic reaction, clinical signs and symptoms.
6. Acute transfusion related lung injury, alloimmunization, Iron overload, Graft versus host disease
7. Strategies to prevent transfusion reactions
8. Autologous blood transfusion, Hemodilution technique, Red cell harvesting for autologous blood transfusion
9. Hospital transfusion committee, transfusion audit.

## **Paper IV**

### **Section two: Quality Control Documentation and legal Aspects of blood Banking**

1. Quality control of blood grouping reagents, QC of anti-human globulin reagent, bovine albumin, Normal saline
2. Quality control of blood bank raw materials and kits
3. Quality control of different blood bank Components, sterility test on component.
4. Automation in blood bank
5. Calibration, validation and maintenance of blood bank equipment, QC of blood bank techniques, internal and external QC.
6. Organization of blood bank services, Blood Bank premises and infrastructure, Regional blood transfusion centre and blood storage centres, Blood bank management system
7. Regulations for blood bank operation: Drugs and cosmetics Law, National blood policy, standards in Blood Banking, licensing procedures.
8. Recruitment and training of blood bank personnel, Proficiency test.
9. Blood Bank Accreditation.

## Reference Books

1. The Gazette of India, Part II Section 3, Subsection (1), Ministry of Health and Family Welfare, Drugs and Cosmetics Act 1940, Drugs and Cosmetics Rule 1945 Notifications 5<sup>th</sup> April 1999, 29<sup>th</sup> January 2001 and 28<sup>th</sup> March 2001.
2. Rossi principle of Transfusion Medicine, 4<sup>th</sup> edition
3. Handbook of the clinical use of blood, WHO Geneva, 2001.
4. Standards for blood banks and blood transfusion services, NACO Ministry of Health and Family Welfare, Govt. of India, New Delhi 2007.
5. AABB Technical Manual, 16<sup>th</sup> ed, AABB, USA
6. Modern Blood Banking and Transfusion practices. Denise M Harmening, 5<sup>th</sup> edition
7. Transfusion Medicine technical manual. Director General of Health Services, Ministry of Health and Family Welfare, Govt. of India, Second edition, 2003.
8. Recent trends in transfusion medicine. Snehalata C. Gupte, PK Desai, SRKRC Publication, 2002.
9. Compendium of transfusion medicine, RN Makroo, Alps printer, 1999.
10. Standards on Blood Banks/Blood Centres and Transfusion Services, 2007
11. AABB standards for Blood Banks and transfusion Services, 24<sup>th</sup> Edition
12. NACO standards: Standards for Blood banks and Blood transfusion Services
13. NABH standard: standard for blood banks.

## Practicals based on Paper IV

1. Titre of anti-A/anti-B reagents.
2. Rh Genotype determination
3. Titre of anti-D reagents with Homozygous and Heterozygous Rh positive cells
4. Avidity of anti-A/anti-B and anti-D reagents.
5. Specificity of Anti-A, Anti-B and Anti-AB reagents
6. Specificity of Anti-D reagents
7. Anti-IgG and anti C3d titre of antihuman globulin reagents.
8. Quality control of 22% bovine albumin
9. Quality control of Papain Cystein.
10. Quality control of Copper sulphate solution
11. Quality control of LISS
12. Determination of red cell contamination in platelet product.
13. Determination of WBC contamination in platelet product.
14. Demonstration of fully automatic blood grouping system.
15. Sterility test on whole blood.
16. Writing standard operating procedures.
17. Validation of refrigerators, cold room, incubator etc.
18. Validation of Laminar air flow cabinet.