

Syllabus of “Post Graduate Diploma in Blood Bank Technology” (PGDBBT) Submitted to Veer Narmad South Gujarat University

“Diploma in Blood Bank Technology” will be one Year post graduate 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 papers will be 280 for the University Examination, distributed as 70 for each Paper of three hours duration. The internal evaluation marks will be 120 will be 30 marks of each paper. The total marks of Practical will be 240 distributed as 60 marks for each practical paper, I to IV. The internal practical evaluation will be of 60 marks, distributed as 15 marks for each practical paper. The University Examination for practicals will be of total 24 hours.

Eligibility Criteria: B. Sc with Microbiology, Medical Technology, Biotechnology or Bio-science degree from Veer Narmad South Gujarat University or any other equivalent recognized university.

Paper I

Section One: Immunohaematology

1. Basic Principles of immunohaematology, Application of Blood groups: Population Genetics, Forensic medicine, 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, Celano, In, Private antigens, Public antigens.
5. Antenatal Serology, 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. Pre transfusion testing, 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 screening/estimation: Copper sulphate, hematology analyzers, Sahli's, Cyanmethhemoglobin and Hemo-Q methods, Red cell indices
3. Normal erythropoiesis, Leucopoiesis, Formation and function of platelets
4. Classification of anemia, their laboratory diagnosis, Hemoglobinopathy: 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 coa, Hemophilia A & B, Platelet disorders,
7. Hematological malognancies
8. Bone marrow transplantation, peripheral stem cells, cord blood stem cells, cord blood banking

Reference Books

1. Blood transfusion clinical medicine. PL Mollison CP Engelfriet and Marcela Contreras. 10th ed. Blackwell Science, London, 1997.
2. Procedures in blood banking and immunohaematology. HM Bhatia, BGRC, ICMR Publication, Bombay, 1977.
3. AABB Technical Manual, 12th ed, AABB, USA, 1996.
4. Modern Blood Banking and Transfusion practices. Denise M Harmening, First Indian Edition, FA Davis Company, 1998.
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. Compendium of transfusion medicine, RN Makroo, Alps printer, 1999.
8. Hematology today. M. B. Agrawal, Ashirwad haematology centre, Mumbai, 2007.
9. Practicle Hematology, J A Decie and S M Lewis, The ELBS, 8th Edition.
10. Modern Hematology: Biology and Clinical Management. R. Munker, E Hiller and R Paquette, Humana Press, 2000
11. Dailey's notes on blood. J F Dailey 3rd ed. Jaypee Brothers, New Delhi, 1996.

Practicals based on Paper I

1. ABO cell and serum grouping by tube method
2. Rh typing by saline, enzyme and albumin methods.
3. Preparation LISS.
4. Preparation of Papain cystein.
5. Routine major and minor cross-matching.
6. Direct and Indirect antiglobulin method.
7. Rh typing by indirect antiglobulin method.
8. Anti-A, anti-B and anti-D titre saline phase.
9. Gel technology (Demonstration).
10. Investigations of haemolytic transfusion reaction.
11. Different methods of Detection of blood group antibodies.
12. Identification of blood group antibodies
13. Hemoglobin estimation by Cyanmethhemoglobin method
14. Preparation of Copper Sulphate solution.
15. Hb estimation on Hematology Analyser.
16. Total RBC and WBC count.
17. WBC differential count and examination of blood smear for red cell abnormalities.
18. Platelet count.
19. Reticulocyte count.
20. Hb electrophoresis.
21. Sickling and solubility tests.

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, Flowcytometry 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. Bacteriological media, Pure cultures and cultural characteristics, Bacteria of medical importance,
4. Transfusion transmitted infections, HIV (1+2), HCV, HBV, malaria, syphilis
5. ELISA, rapid and other tests for diagnosis of transfusion transmitted infections
6. Biosafety, Management of Biomedical waste
7. Introduction to Biochemistry, Acid and Base, Buffers and Buffer action, pH, The Beer Law & its application
8. Carbohydrates, proteins, Lipids and Lipoproteins, Red cell membrane integral proteins and lipids, Biochemical estimation of Blood sugar, proteins, Lipid profile and kidney function tests
9. Instrumentation principles: pH meter, colorimeter, Spectrophotometer, Electrophoresis equipment

Reference Books

1. Basic Immunology, A K Abbas and A H Lichtman. Second ed, Saunders Elsevier, 2006.
2. Essential Immunology. I Roitt, 8th ed, Blackwell scientific publications, London, 1994.
3. Immunology: The immune system in health and diseases. CA Janeway, P Travers, 3rd ed, Current Biology Ltd, London, 1997.
4. The immune system. I McConnell, A Munro, H Waldmann 2nd 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, 4th ed., Prentice Hall Inc.
7. Mackie and McCartney Medical Microbiology, A guide to Laboratory Diagnosis and Control of Infection, 13th ed., J P Duguid, B P Marmion and R H A Swain. The English Language Book Society and Churchill Company.
8. Fundamentals of Microbiology, Frobisher, Hinsdill, Crabtree and Goodheart, 9th ed., W. B. Saunders Company.
9. Diagnostic Microbiology, Finegold and Martin, 6th ed., The C. V. Mosby Co.,

10. Bailey and Scott's Diagnostic Microbiology, Sydney M. Finegold and Eelln Jo Baron, 7th ed., the C. V. Mosbey Co.,
11. Microbiology, Pelczar, Reid Chah, 4th ed., Tata McGraw Hill Publishing Co. Ltd.
12. Practical Medical Microbiology, Collee Duguid, Fraser, Marmion, 24th ed., Churchill Livingston.
13. Outlines of Biochemistry. Elonn K Stumpt, G Bruency and H Dol, John Weiley and Co., 5th ed.
14. Practical Clinical Biochemistry, H. Varley, 4th ed, CBS Publishers.
15. Basic molecular and cell biology. David Latchman. BMJ Publishing group, 1997.

Practicals based on Paper II

Immunology

1. ELISA for HBsAg detection.
2. Rapid tests for HBsAg detection.
3. HCV antibody detection by ELISA.
4. HCV antibody detection by Rapid tests.
5. HIV (1+2) antibody detection by ELISA.
6. HIV (1+2) antibody detection by Rapid Tests.
7. VDRL test for Syphilis.
8. RPR test for Syphilis.
9. Malaria Parasite detection: Slide Method.
10. Malaria Parasite detection: Rapid Method.
11. Cleaning neutralization and preparation of glassware for sterilization.
12. The Gram Stain.
13. The Acid fast Stain.
14. Staining for cell structure of organism.
15. Preparation of culture media.
16. Blood Glucose estimation.
17. Blood urea estimation.
18. Blood Cholesterol (Free and total) estimation.
19. Bilirubin estimation.
20. Serum Iron and TIBC estimation.
21. 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 felicitation
3. Tapping room equipment, their principles, and use, emergency medicines, Pre donation counseling, Bleeding of the donor, post donation care, post donation counseling,
4. Screening of blood units for mandatory tests, Discarding infected units,
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

Section Two: Blood Banking: Blood Components

1. Selection of blood bags for component preparation, preparation of red cell concentrate, Fresh Frozen plasma, platelet concentrate, cryoprecipitate, washed red cells, Frozen red cells
2. Plasma Fractionation: Principles, manufacturing of different plasma derivatives
3. Component Testing, Labeling,
4. Transportation and storage of blood components.
5. Preparation of leukoreduced blood products, Leukocyte filters, component extractors.
6. Metabolic changes in blood components during storage, release of cytokine during storage.
7. Inventory management and maintenance of blood stock.
8. Irradiated blood components
9. 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. 10th ed. Blackwell Science, London, 1997.
4. Procedures in blood banking and immunohaematology, HM Bhatia, BGRC, ICMR Publication, Bombay, 1977.
5. AABB Technical Manual, 12th ed, AABB, USA, 1996.
6. Modern Blood Banking and Transfusion practices. Denise M Harmening, First Indian Edition, FA Davis Company, 1998.
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.

Practicals based on Paper III

1. Blood Collection using syringe.
2. Bleeding of the blood donor.
3. Operation of blood collection monitor, tube sealer and needle burner.
4. Platelet pheresis on cell separator (Baxter).
5. Platelet pheresis on cell separator (Gambro or Hemonetics).
6. Preparation of red cell concentrate and fresh frozen plasma.
7. Preparation of washed red blood cells.
8. Preparation of platelet concentrates by PRP method.
9. Preparation of platelet concentrates by buffy coat method.
10. Blood component preparation on component extractor.
11. Preparation of leukoreduced platelets using leukocyte filter.
12. Testing of haematological parameters of blood products.

13. Measurement of factor VIII level in FFP
14. Measurement of fibrinogen level in FFP
15. Sterility test on platelet concentrates.
16. Sterility test on Whole blood
17. 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 path physiology; 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 5th April 1999, 29th January 2001 and 28th March 2001.
2. Guidelines for the organization of blood transfusion services. WN Gibbs and AFH Britten. WHO Geneva, 1992.
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, 12th ed, AABB, USA, 1996.
6. Modern Blood Banking and Transfusion practices. Denise M Harmening, First Indian Edition, FA Davis Company, 1998.
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.

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.