

**Mahatma Gandhi University**  
of  
**Medical Sciences & Technology, Jaipur**

**Syllabus**  
**B.Sc. Transfusion Medicine Technology**  
( 3 Years Degree Course )

## **Notice**

1. Amendments made by the University in Rules/ Regulations of the courses shall automatically apply.
2. The University reserves the right to make changes in the syllabus/ books/ guidelines, fee-structure or any other information at any time without prior notice. The decision of the University shall be binding on all.
3. The jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.

**SYLLABUS**  
**B.Sc. Transfusion Medicine Technology**  
(3 Years Degree Course)

**Rules & Regulations**

1. **TITLE OF THE COURSE**

The title of the course shall be "B.Sc. Transfusion Medicine Technology".

2. **DURATION OF COURSE/TRAINING**

The course shall be of three years duration from the date of commencement of academic session

3. **MEDIUM OF INSTRUCTION**

English shall be the medium of instruction.

4. **ELIGIBILITY FOR ADMISSION:**

- For admission a candidate should have passed the 10+2 (Senior Secondary) Examination or its equivalent Examination Science stream i.e. Physics, Chemistry and Biology OR Physics, Chemistry and Mathematics Subjects with 45% marks in the aggregate for General Category and 40% for SC/ST/OBC/MBC candidates or as per Govt. Guidelines from a recognized Board.
- Candidate should have completed the minimum age of 17 years as on 31st December of the year of admission.

5. **CRITERIA FOR ADMISSION**

Selection shall be done by an Admission Board of the University strictly on merit. It will consist of a two-step process –Written Entrance Examination followed by Counseling/Personal Interview (PI).

6. **RESERVATION POLICY**

Reservation shall be applicable as per policy of the State Government.

7. **ENROLMENT**

Every candidate who is admitted to the Course in Mahatma Gandhi Medical College shall be required to get himself/herself enrolled with the Mahatma Gandhi University of Medical Sciences & Technology after paying the prescribed eligibility and enrolment fees.

A candidate shall deposit enrolment fees along with tuition fees at the time of his/her admission to the course. Such a candidate who fails to submit, through the college Principal, duly filled enrolment form along with original documents including migration certificate required for enrolment within two months of his/her admission or up to November 30 of the year of admission whichever is later, he/she will have to pay late fee prescribed by the University.

8. **MIGRATION RULES**

- No student, once admitted to the course and enrolled by the University, will be permitted to migrate to any other Course/ University.
- No student will be admitted to the Course on migration from any other Course/ University.

9. **ATTENDANCE**

Minimum 75% attendance in each year, both for theory and practical classes separately. Student with deficient attendance will not be permitted to appear in University examination.

10. **CONDUCTION OF THE UNIVERSITY EXAMINATION:**

University examination shall be conducted twice in a year; that is Main and Supplementary Examination. Supplementary examination shall be conducted after 2-4 months of the main examination.

1. **SCHEME OF EXAMINATION**

i. **Theory**

- a. Each Theory paper examination shall be of 3 hours duration and of maximum marks **70**.
- b. Internal assessment shall be of **30** marks for each Theory Paper.

Theory Papers	Theory		Paper Set & Evaluated	
	Total Marks	Pass Marks	No. of Internal Paper Setters	No. of External Paper Setters
Ist Year: Three Theory Papers	300	150	3	
IInd Year: Three Theory Papers	300	150	3	
IIIrd Year: Three Theory Papers	300	150	2	1

- a) For the First and Second year examinations – these respective above theory papers shall be set by the Internal Examiners covering their respective areas of syllabus. For each question paper there shall be a separate Internal Examiner. The answer books shall be evaluated by the concerned Internal Examiners (Papers Setters).
- c) In Third (Final) Year examination, one of the papers shall be set and evaluated by an External Examiner. In other words, one of the Internal has to be substituted by the External Examiner. The External Examiner (Paper Setter) shall evaluate his/her paper.
- d) The Paper Setter shall set the questions within the prescribed course of study of the concerned paper. There will be a set pattern of question papers duly approved by Academic Council. Model question paper is annexed herewith.

- e) It is to be noted that the Internal and External Examiners of all the three years (First, Second and Third year) shall be appointed by the President of the University. This exercise shall be conducted through the office of the Controller of the Examinations of the University. The External Examiner of Third year shall also be appointed by the President out of the panel of names submitted by the Concerned Coordinator of the course through the Dean to the Controller of Examinations for appointment of Examiners by the President of the University.
- f) Passing Marks: A candidate will have to obtain at least 50% marks in each Theory paper including internal assessment to pass. This shall include the marks obtained in Theory paper of 70 marks and internal assessment for that paper of 30 marks.

**ii. Practical and Viva-Voce Examination**

- a) Each year there shall be practical and viva-voce examination. It shall consist of one University practical and viva-voce examination of 70 marks and internal assessment of 30 marks. A candidate will have to obtain atleast 50% marks in practical and viva-voce examination inclusive of internal assessment to pass.
- b) The pattern of practical examination shall be as follows –

B. Sc. Course	Practical		Practical Examiners
	Total Marks	Pass Marks	
First Year	100	50	02 Internal Examiners
Second Year	100	50	02 Internal Examiners
Third Year	100	50	01 Internal & 01 External Examiner

**iii. Result**

- 1) A candidate will have to obtain at least 50% marks separately in each Theory paper including internal assessment and a minimum of 50% marks in the practical examination inclusive of internal assessment for him to be declared pass.
- 2) A Candidate who has failed in theory paper/s will reappear in respective theory papers/s in supplementary examination.
- 3) Candidate who has failed in Practical examination only will reappear only in practical examination in Supplementary examination.

**iv. Supplementary Examination**

- a) Eligibility for the failed candidates to appear at the supplementary examination shall be as below –
- i. Failed in Theory Paper(s) and failed in Practical – shall reappear in the respective failed Theory paper(s) and Practical examination.
  - ii. Failed in Theory paper/papers and passed in Practical examination – shall reappear only in the concerned failed Theory paper(s).

- iii. Passed Theory papers but failed in Practical – shall reappear only in the Practical Examination.
- b) There shall be a supplementary examination within two months of the declaration of the result of the main examination. Internal assessment marks obtained in main examination in the concerned failed paper/papers/ practical shall be carried forward for working out the result of supplementary Theory paper(s) and/or practical examination. Such candidate who has secured less than 50% marks in the internal assessment will be allowed to improve his internal assessment marks in the repeat supplementary internal assessment examination.
- c) Marks secured by the candidate in passed main examination/supplementary examination Theory paper(s) and/or practicals, as the case may be, will be carried forward for working out his result.
- d) **Result:**
  - i. A candidate obtaining at least 50% marks in the supplementary Theory paper(s) and 50% marks in the supplementary practical examination, as the case may be, shall be declared successful.
  - ii. A candidate who has failed in supplementary theory paper(s) examination shall have to reappear only in the failed theory paper(s) at the subsequent examination.
  - iii. A candidate who has failed in supplementary practical examination shall have to reappear both in theory (all papers) and practical at the next main examination.
- v. **Promotion to Second/Third Year**
  - 1) A candidate appeared in the University examination and failed in theory paper(s) /Practical examination shall be promoted to next year
  - 2) A candidate will be allowed to appear for the Final (3<sup>rd</sup>) year examination only when the backlog of all papers (theory and practical) of first year and second year exams is cleared
  - 3) The student is required to complete the course within 6 years from the joining of the course

vi. **Result - Division:** Successful candidates will be categorized as under –

1.	Those, securing 50% and above but less than 60% in the aggregate marks of First, Second & Third year taken together	-	Pass
2	Those, securing 60% and above but less than 75% in the aggregate marks of First, Second & Third year taken together	-	Pass with I Division
3	Those, securing 75% and above in the aggregate marks of First, Second & Third year taken together	-	Pass with Honors

(3 Years B.Sc. Degree Course)

**1. COURSE OF STUDY:**

**B. Sc. in Transfusion Medicine Technology Part – I**

Subject	Maximum marks		
	Theory	Int. Ass.	Practical
Paper I : Fundamentals of Physiology & Basics of Biochemistry	70	30	
Paper II : Hematology & Clinical Pathology	70	30	
Paper III : General Microbiology	70	30	

**PART I**

**a) Theory:**

**PART I PAPER I: FUNDAMENTALS OF PHYSIOLOGY & BASICS OF BIOCHEMISTRY**

**Fundamental of Physiology** (General outline along with the functional anatomy of various body systems)

1. Cell: Structure & function
2. Tissue: Epithelium, Connective, Sclerous, Muscular & Nervous
3. Blood: Blood cells, Hemoglobin, Blood groups, Coagulation Factors, Anemia & Immunoglobulins
4. Cardiovascular system: Heart rate, cardiac cycle, cardiac output, blood pressure, hypertension, radial pulse, Measurement of pulse, blood pressure,
5. Respiratory System: Ventilation, Functions, Lungs Volumes and capacities
6. Gastrointestinal System: Process of digestion in various parts
7. Endocrinology: Endocrine Glands, Hormones - Their secretion and functions
8. Excretion system: Structure of nephron, Urine formation
9. Central Nervous System: Parts, Sliding Filament Theory, Neuromuscular Junction, Motor Nervous system, Sensory nervous system, Sympathetic Nervous system, Parasympathetic nervous system
10. Reproductive System: Male and Female reproductive systems
11. Skin: Structure & Function
12. Muscular System : Classification of muscles & their functions

## **Basics of Biochemistry**

1. Introduction to Apparatus, Chemical Balance: Different types, Principles and Practice.
2. Concepts of Molecular weight, Atomic weight, Normality, Molarity, Standards,
3. Atomic structure, Valence, Acids, Bases, Salts, & Indicators.
4. Chemistry of carbohydrates & their related metabolism: Introduction, definition, classification, biomedical importance & properties.
5. Brief outline of metabolism: Glycogenesis & glycogenolysis, Glycolysis, Citric acid cycle & its significance, HMP shunt & Gluconeogenesis, regulation of blood glucose level, Hyperglycemia & hypoglycemia, Diabetes mellitus - definition, types, features, gestational diabetes mellitus, glucose tolerance test, glycosurias, Hypoglycemia & its causes
6. Amino acids: Definition, classification, essential & non essential amino acids.
7. Chemistry of Proteins & their related metabolism: Introduction, definition, classification, biomedical importance.
8. Metabolism: Transamination, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine, Proteinuria.
9. Chemistry of Lipids & their related metabolism: Introduction, definition, classification, biomedical importance, essential fatty acids.
10. Brief out line of metabolism: Beta oxidation of fatty acids, Fatty acid synthesis, Ketosis, Cholesterol & its clinical significance. Lipoproteins- composition & functions, Fatty liver & Atherosclerosis.
11. Chemistry of Nucleic acids: DNA Structure and function, RNA Types: Structure and function.
12. Vitamins: Fat & water soluble vitamins, sources, requirement, deficiency disorders & biochemical functions.
13. Enzymes: Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, enzyme inhibition, diagnostic value of serum enzymes

## **PART I PAPER II : HEMATOLOGY & CLINICAL PATHOLOGY**

1. Blood collection
2. Anticoagulants used in Hematology
3. Normal values in Hematology
4. Basic Hematological Techniques: RBC count, Hemoglobin estimation, Packed cell volume.
5. Calculation of absolute indices: WBC counts-Total and differential, Absolute eosinophil count, Platelet count, Erythrocyte sedimentation rate, Reticulocyte count
6. Preparation of blood films
7. Stains used in Hematology



8. Morphology of blood cells
9. Classification of Anemia (Morphological & etiological), Definition, causes, classification & lab findings of Iron Deficiency Anemia, Megaloblastic Anemia, Hemolytic Anemia
10. Bone Marrow : Cell composition of normal adult Bone marrow
11. Leukemia: Classification
12. Urine examination: Physical, Chemical & Microscopic
13. Examination of body fluids, cell counts

### **PART I PAPER III: GENERAL MICROBIOLOGY**

1. Introduction & History of Microbiology
2. Development of microbiology as a discipline, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Edward Jenner.
3. Microscopy : Study of compound microscope-magnification, numerical aperture, resolution and components of microscope, different types of microscopy-Bright field microscope, Dark field microscope, Phase contrast microscope, Electron Microscope-Transmission & Scanning Electron Microscope, Precautions and care of microscope
4. General characters and classification.
5. Bacterial division, Batch Culture, Continuous culture, bacterial growth- total count, Viable count, bacterial nutrition, oxygen requirement, CO<sub>2</sub> requirement, temperature, pH, light.
6. Physical agents- Sunlight, Temperature less than 100°C, Temperature at 100°C, steam at atmospheric pressure and steam under pressure, irradiation, filtration.
7. Chemical Agents- Alcohol, aldehyde, Dyes, Halogens, Phenols, Ethylene oxide.
8. Simple, Grams staining
9. General Principles, Containers, Rejection, Samples- Urine, Feces, Sputum, Pus, body fluids, Swab, Blood.
10. Non-infectious waste, infected sharp waste disposal, infected non-sharp waste disposal.
11. Causative methods, transmission methods, investigation, prevention and control of Hospital Infection

## **PART I**

### **b) Practical**

- Introduction to microscope, apparatus, Glassware, Equipments.
- Preparation of solutions, calculation of Molecular Weights and Equivalent Weights,
- Preparation of Normal solutions, percent solution and reagents, dilution techniques.
- Maintenance of Laboratory Glassware and apparatus.
- Centrifugation: Principle, types & applications..
- Measurement of hydrogen ion concentration.
- Urine analysis – normal & abnormal constituents of urine.
- Demonstration of colorimeter, spectrophotometer, pH meter, single pan balance.
- Chromatography: Definition, types, RF value, description of paper chromatography & applications.
- Electrophoresis: Principle, Types & Applications.
- Anticoagulant vial preparation.
- Determination of Blood group, Complete Blood Counts.
- TLC Count by Hemocytometers.
- Urine examination: Physical, Chemical and Microscopic
- Blood smear preparation
- Preparation of swabs/sterile tubes & bottles.
- Demonstration of Autoclave & sterilization
- Demonstration of glasswares used in microbiology
- Visit to hospital for demonstration of Biomedical Waste Management

## PART – II (B. SC. IN TRANSFUSION MEDICINE TECHNOLOGY )

Subject	Maximum Marks		
	Theory	Int.Ass.	Practical
<b>Paper I</b> : Blood Banking Organizaion	70	30	
<b>PaperII</b> :Blood donation and donor management	70	30	
<b>PaperIII</b> : Basic Immunohematology & Transfusion Transmitted Infection	70	30	

### a) Theory

#### PART - II PAPER I : BLOOD BANKING ORGANIZATION

- History of Transfusion Medicine
  - Identify and relate the important features of the history of transfusion medicine
  - Outline the scientific benchmarks in the evolution of transfusion medicine-
  - Explain how specific innovations affected transfusion medicine practice
  - Describe recent trends in the practice of transfusion medicine –
- History of development Transfusion Medicine in India- Whole blood, Components & Apheresis, Recent developments –
- Organization of blood bank services Regional blood transfusion center, Blood banks and blood storage centres, Blood Bank premises and infrastructure .Mandatory Technical Staffing pattern of blood bank and role, functions and responsibility of each Technical staff.
- Technical requirements: Accommodation and environmental conditions, Blood bank management system, Regulations for blood bank operation, Drugs and cosmetics Law, National blood policy, standards in Blood Banking, licensing procedures, ethical aspects of blood transfusion
- Statutory regulators of Blood banking in India- Drug controller of India, State, Director General Health services & NACO.
- Indian Drugs and cosmetic act and rules 1945 pertaining to Blood bank.
- Indian & other Pharmacopeia pertaining to blood products.
- Licensing norms, Inspections and Compliance.
- Terminologies used in blood banking including blood donation.
- Introduction blood and blood products.
- Introduction to Blood bank equipments
- Weights, Volume. Specific gravity, Conversion of weight to volume, Volume dilutions, Weight dilutions etc.
- Etiquette and discipline to be maintained in blood bank-
- Reporting Formats and statistics

## **PART - II PAPER II : BLOOD DONATION AND DONOR MANAGEMENT**

- Donor Motivation, Motivational Techniques, Social awareness, Preparation of IEC Materials. Blood donation Motivating factors for donation
- Types of blood donors, Donor selection,
- Donor questionnaire and interview: Eligibility and deferral criteria, medical interview and medical examination
- Pre donation Investigations -haemoglobin estimation & Blood grouping
- Equipments & Reagents used in screening, investigations.
- Managing rejected blood donors, technique for conversion of first time donor into regular voluntary donor, donor felicitation.
- Donor recruitment & Retention.
- Pre donation & Post donation donor counselling.
- Medico-legal Aspects, NACO & DGHS guidelines.
- Right to information, Donor Consent, reports, Leave letters, certificates
- Blood collection room equipment, their principles, and use, emergency medicines,
- Pre donation counselling, Solutions & Method for Preparing Phlebotomy Site, Test Tube Samples– Method of accurately relating product to donor bleeding of the donor, post donation care.
- Mandatory emergency medicines to be made available and their uses. Donor reactions and their management .
- Screening of blood units for mandatory tests, discarding infected units, post donation counselling.
- Blood Donation drive: Awareness programs prior to blood donation drive, Camp site, staff requirement, management of camp, transportation of blood units from camp site to blood bank.
- Different types of Blood Collection – Autologous blood donation, Therapeutic Phlebotomy Preservation of donated blood, blood preservation solutions, Additive solutions.
- Blood salvaging.

## **PART - II PAPER III: BASIC IMMUNOHEMATOLOGY & TRANSFUSION TRANSMITTED INFECTION**

- Introduction to Immunology, History, Immunity, Cells of immune system: Phagocytic cells, Antigen presenting cells, T cells, T cell subsets, B cells, CD Markers.
- Antigens: Immunogen, allo-antigen, soluble antigen, Red cell antigen, Epitopes immunoglobulins, characteristics of immunoglobulins, Complement System, HLA system.
- Antibodies: Polyclonal anti bodies, development of antibodies, structure of Monoclonal antibodies: Hybridoma technology, Human monoclonal antibodies.
- Antigen antibody reaction: Antigen concentration, antibody concentration, enhancing media, other factors influencing antigen antibody reaction.
- Basic Principles of immuno hematology, application of blood groups, population Genetics.
- Application of Blood groups: -Population Genetics, Forensic medicine, Transfusion medicine. ABO Blood of Group Systems: History, Genetics, ABH antigens, Biochemical Synthesis of blood group antigens, Antigenic sites, weaker variants, Bombay Phenotype, ABO antibodies.
- Red cell serology techniques, their advantages and disadvantages, Cell and serum grouping, detection of weak A and B antigens, Trouble shooting in red cell serology
- 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.
- Other Blood Group Systems: Lewis, P, Ii, MNSs, Kell, Duffy, Celano, In, Private antigens, Public antigens.
- Principles of Direct and indirect antiglobulin test technique, Weak Rh D Typing.
- Antenatal Serology, Hemolytic disease of the newborn due to ABO Incompatibility, Rh Incompatibility and other allo-antibodies
- Pre transfusion testing - Patient specimen labelling requirements, Patient / component identification requirements.
- Different methods of cross matching, Saline Cross match, Saline replacement for rouleaux, enzyme technique, albumins technique, anti-globulin cross-matching.
- Cross matching in special circumstances, emergency cross matching, electronic cross matching. Abbreviation of compatibility testing in emergency. Micro plate techniques
- Study of major transfusion transmitted infection caused by viruses, Pathology, epidemiology Hepatitis B, Hepatitis C , Human immunodeficiency viruses 1 and 2, HTLV viruses I and II, and West Nile virus (WNV). Implication of the other viral diseases for blood transfusions: Epstein-Barr virus, cytomegalovirus (CMV), parvovirus B19 and Creutzfeldt-Jakob disease .
- Transfusion associated parasites – Malaria & others. Syphilis and other pathogens. Malaria and syphilis by various methods and understand principles of testing. Understand and be able to interpret non treponemal and treponemal antibody tests used to diagnose syphilis. Transfusion associated infections with other bacterial / fungal / protozoal infections.

- Basic principles of ELISA test, various types of ELISA, Laboratory screening tests for TTI, Spot tests, Limitation of various tests.
- Quarantine and recipient tracing, procedures for look-back and recipient follow-up.
- Compare & contrast various methodologies such as ELISA, rapid & chemiluminescence used in screening of transfusion transmitted infections. National policy on TTI testing of blood donors.
- Chemiluminescence, NAT, Western Blot, Automation in blood donor TTI screening. Confirmatory tests for TTI testing.
- Demonstrate proficiency in the preparation and use of internal control in transfusion transmitted infection screening.
- Quality control and documentation. Proficiency testing – IQUAS & EQUAS Pathogen reduction, Cellular components and plasma components.
- Discard of Blood Parts and Documentation of records, Universal precautions – Bio waste management.
- Disposal of Reactive Bags, its components. Demonstrate proficiency in proper disposal of bio hazardous material as per recommended standards.

## **PART II**

### **b) Practical:**

- Preparation of phlebotomy site.
- Operation of blood collection monitor, tube sealer and needle burner.
- Donor Room Protocol, Donor Screening Qualifying Test For Blood Donation- Laboratory investigations
- Donor Suitability / Selection
- Selection Of Bags For Collection Of Blood
- Blood Collection – Solutions & method For Preparing Phlebotomy Site
- Test Tube Samples – arrangement and requirement
- Blood Collection – Method Of Accurately Relating Product To Donor
- Blood Collection Procedure
- Post Blood Donation Care
- Post donation instructions
- Management Of adverse reaction
- Determination of ABO & Rh Blood Group (Reverse & Forward) – Tube method & CAT method
- Preparation of 3-5% Red Cell Suspensions

- Reading, Grading and Recording Results
- Performing Direct Anti-globulin Test & Indirect Antiglobulin Test
- Saline cross match
- Performing Anti-globulin Cross-Match
- Anti A and anti B titer estimation
- Weak D testing
- Identification of antiseras
- CLIA & ELISA for HBsAg, HIV,HCV & Syphilis detection.
- Rapid tests for HIV, HCV, HBsAg, Malaria and Syphilis detection.
- RPR test for Syphilis.
- Biomedical waste management exercises

### **PART –III (B.Sc. IN TRANSFUSION MEDICINE TECHNOLOGY )**

Subject	Maximum Marks		
	Theory	I Ass.	Practical
<b>Paper I:</b> Blood Components and Transfusion Therapy	70	30	
<b>PaperII:</b> Blood Bank Equipments ,Documentation & Quality Control	70	30	
<b>Paper III :</b> Apheresis and Recent advances	70	30	

#### **a) Theory**

#### **PART III PAPER I : BLOOD COMPONENTS AND TRANSFUSION THERAPY**

- Basic steps in component preparation & labeling.
- Composition & storage Composition: volume, cellular, plasma and clotting factor content.
- Equipments used for component preparation.
- Selection of blood bags for component preparation.
- Care and precautions to be taken during whole blood collection and before component preparation.
- Programming for component preparation, PRP & Buffy coat methods & Other methods of component preparation.
- Preparation of red cell concentrate, Fresh Frozen plasma, other plasma products platelet concentrate, cryoprecipitate, washed red cells.
- Plasma Fractionation: Principles, manufacturing of different plasma derivatives.

- Storage conditions for components “Storage lesions”- Metabolic changes in blood components during storage, release of cytokine during storage.
- Component Testing, Labeling, Transportation and storage of blood components.
- Inventory management and maintenance of blood stock
- Modified blood components: Preparation of leukoreduced blood products, Leukocyte filters, Irradiated blood components, Blood substitutes, Washed /plasma reduced blood components, frozen red cells.
- Specialized blood components –CMV free and HLA matched & Blood substitutes, Recombinant clotting & hematopoietic growth factors.
- Quality control of components: Measurement of factor VIII level in FFP, Measurement of fibrinogen level in FFP, Measurement of pH and other platelet parameters, Sterility test on platelet concentrates, Sterility test on whole blood and Packed red blood cell concentrate.
- Plasma fractionation products & Pathogen inactivation methods.
- Management of Blood Bank Issue Counter, Criteria for acceptance of requisition form.
- Inspection and selection of blood component.
- Plan for transfusion. Criteria for issue of blood and blood Components.
- Use red cell components in of different types of anemia, Use of blood components in bleeding patient, Neonatal transfusion, and Transfusion practices in surgery, Selection of units for cross matching,
- Transfusion therapy for oncology and Trans plantation patients.
- Transfusion indications Red blood cells, Platelets, Plasma / cryoprecipitate, Granulocytes.
- Pre Transfusion strategies in special cases regarding samples, techniques and protocols in special patients circumstances -Paediatric / neonatal, Obstetric including intra uterine, cardiac surgery , burn patients & trauma patients.
- Blood administration, transfusion filters, post transfusion care, maximal surgical blood order schedule.
- Immune haemolytic anaemia, warm & cold type, drug induced haemolytic anaemia.
- Thrombocytopenia Immune thrombocytopenic purpura. Thrombotic thrombocytopenic purpura. Post transfusion purpura.
- Fetal and neonatal thrombocytopenia.
- Granulocyte transfusion.
- Platelet refractoriness Recognition and evaluation.
- Calculation of CCI and platelet recovery
- Transfusion reactions Diagnosis, Pathophysiology, Investigations.



- Hemolytic transfusion reaction - immediate and delayed; immune and non-immune reaction path physiology; Clinical signs and symptoms and laboratory investigation for HTR, Transfusion reaction work up.
- Non- hemolytic transfusion reactions Immediate and delayed, bacterial contamination, febrile reaction, Allergic reaction, Transfusion related lung injury, PTP, Alloimmunization, Iron overload, Graft versus host disease.
- Current risk & Prevention strategies of transfusion reactions and rational use of blood components

### **PART III PAPER II: BLOOD BANK EQUIPMENTS ,DOCUMENTATION & QUALITY CONTROL**

- General Lab equipments
- Colorimeters & Elisa readers, washers
- Thermometers
- Weighing devices
- Refrigerators
- Platelet agitators & Incubators
- Deep freezers
- Thawing bath & devices
- Plasma expressers
- Sterile connecting devices
- Apheresis equipments
- Computers
- Software & Hardware
- Temperature regulating devices (Incubators, Hot air oven)
- Autoclaves
- Cell washers
- HIS
- Automation platforms
- Blood serology: Various reagents & Kits ordering, specifications & Documentation
- TTI Kits- Ordering, specifications and documentation
- Quality control, assurance and management systems.
- Quality control of empty blood bags. Quality control of different blood bank Components, sterility test on component.
- Quality control of blood bags, Quality Assurance Hb &PCV, Quality control of blood grouping reagents, QC of anti-human globulin reagent, bovine albumin, Normal saline, Antisera etc., QC of TTI test kits – ELISA,CLIA & Rapid

- Quality control of all equipments, Calibration, validation and maintenance of blood bank equipment.
- QC of blood bank techniques Quality Assurance - Temperature Records, Sterility Testing. Internal QC and External QC
- Quality parameters of various blood components, Quality Assurance blood components – red cells, FFP, cryoprecipitate, platelets, Red Cell and WBC contamination.
- Calibration, validation and maintenance of blood bank equipment, QC of blood bank technique.
- Documents, Registers, Records & Formats to be kept. Licensing, Drug authorities' inspection and compliance.
- Registers forms, Documentation and Standard operating procedures (SOP or GMP), Blood bank management system, Regulations for blood bank operation, Drugs and cosmetics Law, National blood policy, standards in Blood Banking, licensing procedures, ethical aspects of blood transfusion.
- Hospital Transfusion Committee. Blood Bank Accreditation- . ISBT, NABL, NABH standards and accreditation.
- Legal and ethical aspects, Regulatory Acts, Bio hazard Waste Disposal Act, National blood policy.

### **PART - III PAPER III :APHERESIS AND RECENT ADVANCES**

- Apheresis procedures, Apheresis products, Maintenance of cell separator equipment.
- Apheresis products, preparation of multiple products on cell separators- Plateletpheresis, Plasmapheresis (Single donor & TPE), Leukapheresis (Granulocyte & Peripheral hematopoietic blood stem)
- Latest trends in blood banking- Donor screening, retention, Blood collections, components etc.Recent advances in Automation of Blood Banking.
- Nucleic Acid Testing. Stem Cells & Cord stem cell banking.
- Stem cell- Cord blood, Peripheral blood Haematopoietic stem cell and Stem cell banking and application.
- Procedures of collection of stem cell and calculation of stem cell collected.
- Quality control of products.
- Cryopreservation, maintenance, QC and thawing procedures in stem cell banking.
- Regenerative medicine.
- Recent Journals.

## **PART - III**

### **b) Practical**

- Refrigerated centrifuge operation, various programs for preparing of blood components
- Preparation of packed red cells
- Preparation of FFP
- Preparation of Washed Packed cells
- Preparation of Cryoprecipitate and Cryo depleted plasma
- Preparing random donor platelets
- Operation of Laminar Flow
- Leukodepletion of red cells
- Leukodepletion of platelets
- Learning blood component separation-Buffy Coat Method
- Quality control of Components
- Operation and principle of Apheresis Machine
- Therapeutic Plasma Exchange
- Peripheral Stem Cell collection
- Irradiation

### **Reference Books:**

- Textbook of Medical Physiology by G.K. Pal.
- Review of Medical Physiology by Ganong.
- Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III  
Tata McGraw Hill Publication.
- Text book of Medical Biochemistry by Ramakrishna
- Clinical Chemistry - Principle and techniques by RJ Henry, Harper & Row Publishers.
- Text Book Biochemistry by Vasudevan and Sree Kumari
- Basic Pathology by Robbins
- Basic laboratory procedures in clinical bacteriology, 1st Edition, J P Brothers, New Delhi
- Textbook of Microbiology for nurses. C.P.Baveja. 2009. Third edn
- Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition
- Transfusion Medicine technical manual-DGHS, Ministry of Health and FamilyWelfare,  
Govt. of India, Second edition, 2003

- Blood transfusion in clinical medicine by PL Mollison
- AABB Technical Manual, 17th ed, AABB
- Compendium of transfusion medicine, RN Makroo
- Practical Hematology, J A Dacie and S M Lewis
- Basic Immunology, A K Abbas and A H Lichtman. Second ed, Saunders Elsevier.
- Essential Immunology. I Roitt, 8th ed, Blackwell scientific publications
- Basic molecular and cell biology. David Latchman. BMJ Publishing group, 1997.
- Voluntary blood donation program NACO, Ministry of Health and Family Welfare, Govt. of India, New Delhi, 2007.
- National guide book in blood donor motivation. NACO, Ministry of Health and Family Welfare, Govt. of India.
- Standards for blood banks and blood transfusion services, NACO, Ministry of Health and Family Welfare, Govt. of India, New Delhi 2007.

## MODEL PAPER

B.Sc. Trans Med Tech.-I  
Code

Short Name

### **B.Sc. Transfusion Medicine Technology** Part-I (Main) Examination Month Year

#### **Paper - I** **Fundamentals of Physiology & Basics of Biochemistry**

**Time: Three Hours**  
Maximum Marks: 70

Students shall be allowed to take only one supplementary copy along with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answered at different places in the answer book  
Draw diagrams wherever necessary

**Attempt all questions**

- Q.1. Define cellular components of human whole blood . Write the importance of platelet in normal hemostasis. 15
- Q.2. Enumerate and discuss the role of important enzymes in Glycolysis 15
- Q.3. Long Answer Type 10x2=20
- a) HMP Shunt
  - b) Coagulation Factors
- Q.4. Short Notes (any 4 out of 6) 4x5=20
- a) Immunoglobulin
  - b) Blood Pressure
  - c) Essential Amino Acid
  - d) Prothrombin time
  - e) Vitamin K
  - f) Fetal hemoglobin

## MODEL PAPER

B.Sc. Trans Med Tech.-I  
Code

Short Name

### **B.Sc. Transfusion Medicine Technology**

Part-I (Main) Examination Month Year

#### **Paper - II**

#### **Hematology and Clinical Pathology**

**Time: Three Hours**

Maximum Marks: 70

Students shall be allowed to take only one supplementary copy along with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answered at different places in the answer book

Draw diagrams wherever necessary

**Attempt all questions**

- Q.1. Define anemia . Discuss Iron deficiency anemia with lab investigation. 15
- Q.2. Enumerate important anticoagulants used in hematology lab. Discuss any two. 15
- Q.3. Long Answer Type 10x2=20
- a) Discuss major stain used in hematology lab.
  - b) Enumerate and discuss methods of hemoglobin estimation.
- Q.4. Short Notes (any 4 out of 6) 4x5=20
- a) Megaloblast
  - b) Reticulocyte Count
  - c) Erythrocyte sedimentation rate
  - d) Urine examination
  - e) Leukemia
  - f) Peripheral blood film

## MODEL PAPER

B.Sc. Trans Med Tech.-I  
Code

Short Name

### B.Sc. Transfusion Medicine Technology

Part-I (Main) Examination Month Year

#### Paper - III General Microbiology

**Time: Three Hours**

Maximum Marks: 70

Students shall be allowed to take only one supplementary copy along with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answered at different places in the answer book

Draw diagrams wherever necessary

**Attempt all questions**

- Q.1. Describe the morphology, clinical features and laboratory diagnosis of HIV/AIDS. Add a note on post exposure prophylaxis. 15
- Q.2. Classify different type of sterilization .Write in detail about moist heat sterilization. 15
- Q.3. Long Answer Type 10x2=20
- a) General and specific measures to prevent hepatitis B virus infection.
  - b) Define and classify hypersensitivity. Write in detail about type I hypersensitivity reaction.
- Q.4 Short Notes (any 4 out of 6) 4x5=20
- a) Gram staining
  - b) Autoclave
  - c) Sterility test
  - d) VDRL test
  - e) Acid Fast Bacilli
  - f) Antigen

**MODEL PAPER**

B.Sc. Trans Med Tech.-II  
Code

**Short Name**

**B.Sc. Transfusion Medicine Technology**  
Part-II (Main) Examination Month Year

**Paper - I**  
**Blood Banking Organization**

**Time: Three Hours**  
Maximum Marks: 70

Students shall be allowed to take only one supplementary copy along with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answered at different places in the answer book

Draw diagrams wherever necessary

**Attempt all questions**

- Q.1 Outline and discuss scientific evolution of transfusion practice in blood center. 15
- Q.2 Discuss Drug and Cosmetic act for blood center. 15
- Q.3 Long Answer Type 10x2=20
- a) Write organogram in blood center as per NABH standard
  - b) Eligibility criteria of technical supervisor
- Q.4 Short Notes (any 4 out of 6) 4x5=20
- a) Donor counseling
  - b) Form 27 C
  - c) Indian Pharmacopeia
  - d) ICTC center
  - e) NACO
  - f) NBTC



## MODEL PAPER

B.Sc. Trans Med Tech.-II  
Code

Short Name

### **B.Sc. Transfusion Medicine Technology** Part-II (Main) Examination Month Year

#### **Paper - II** **Blood Donation and Donor Management**

**Time: Three Hours**  
Maximum Marks: 70

Students shall be allowed to take only one supplementary copy along with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answered at different places in the answer book

Draw diagrams wherever necessary

**Attempt all questions**

- |     |  |         |
|-----|--|---------|
| Q.1 | Write important criteria to organize blood donation camp in detail.                  | 15      |
| Q.2 | Discuss important steps in blood donor management in case of adverse donor reaction. | 15      |
| Q.3 | Long Answer Type   | 10x2=20 |
|     | a) Donor recruitment and retention   |         |
|     | b) Pre donation investigation  |         |
| Q.4 | Short Notes (any 4 out of 6)   | 4x5=20  |
|     | a) Post donation instruction   |         |
|     | b) Crash cart  |         |
|     | c) Informed consent  |         |
|     | d) Bio Medical Waste Rule,2018   |         |
|     | e) Quarantine blood units  |         |
|     | f) Therapeutic phlebotomy  |         |

## MODEL PAPER

B.Sc. Trans Med Tech.-II  
Code

Short Name

### B.Sc. Transfusion Medicine Technology

Part-II (Main) Examination Month Year

#### Paper - III

#### Basic Immunohematology and Transfusion Transmitted Infection

**Time: Three Hours**

Maximum Marks: 70

Students shall be allowed to take only one supplementary copy along with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answered at different places in the answer book

Draw diagrams wherever necessary

**Attempt all questions**

- Q.1 Define autoimmune hemolytic anemia.  
Write diagnostic work up to evaluate a case of AIHA. 15
- Q.2 Enumerate transfusion transmitted infection. Describe any two TTI in detail. 15
- Q.3 Long Answer Type 10x2=20
- a) Chemiluminescence assay
  - b) Nucleic Acid Test
- Q.4 Short Notes (any 4 out of 6) 4x5=20
- a) VDRL Test
  - b) Cold agglutinins
  - c) Antibody screening
  - d) Rh titre
  - e) Donath Landsteiner antibody
  - f) Passive immunization

**MODEL PAPER**

B.Sc. Trans Med Tech.-III  
Code

**Short Name**

**B.Sc. Transfusion Medicine Technology**

Part-III (Main) Examination Month Year

**Paper - I**

**Blood Component and Transfusion Therapy**

**Time: Three Hours**

Maximum Marks: 70

Students shall be allowed to take only one supplementary copy along with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answered at different places in the answer book

Draw diagrams wherever necessary

**Attempt all questions**

- Q.1 Enumerate major steps in component preparation ,self life and storage criteria. 15
- Q.2 Define judicious use of packed red blood cells with its indication 15
- Q.3 Long Answer Type 10x2=20
- a) Methods of random donor preparation
  - b) Quality controls of blood components
- Q.4 Short Notes (any 4 out of 6) 4x5=20
- a) Random Donor Platelet
  - b) Refrigerated centrifuge
  - c) Factors affecting component preparation
  - d) Fresh Frozen Plasma
  - e) Platelet Rich Plasma
  - f) Leukoreduced PRBC

## MODEL PAPER

B.Sc. Trans Med Tech.-III  
Code

Short Name

### **B.Sc. Transfusion Medicine Technology** Part-III (Main) Examination Month Year

#### **Paper - II** **Blood Center Equipments, Documentation and Quality Control**

**Time: Three Hours**  
Maximum Marks: 70

Students shall be allowed to take only one supplementary copy along with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answered at different places in the answer book

Draw diagrams wherever necessary

**Attempt all questions**

- Q.1 Enumerate major blood center equipments. Define functioning and mechanism of any four. 15
- Q.2 Enumerate important blood center registers. Define retention policy of major registers. 15
- Q.3 Long Answer Type 10x2=20
- a) Define Good Manufacturing Practice of blood components.
  - b) Define steps of blood donor counseling
- Q.4 Short Notes (any 4 out of 6) 4x5=20
- a) Master register
  - b) Plasma thawing bath
  - c) Blood Tube Stripper
  - d) Autoclave
  - e) EQAS
  - f) Code Red

## MODEL PAPER

B.Sc. Trans Med Tech.-III  
Code

Short Name

### **B.Sc. Transfusion Medicine Technology** Part-III (Main) Examination Month Year

#### **Paper - III** **Apheresis and Recent Advances**

**Time: Three Hours**  
Maximum Marks: 70

Students shall be allowed to take only one supplementary copy along with one main answer book. All the parts of one question should be answered at one place. Different parts of one question should not be answered at different places in the answer book

Draw diagrams wherever necessary

**Attempt all questions**

- Q.1 Define Therapeutic apheresis and discuss the mechanism of Centrifugal apheresis. 15
- Q.2 What is artificial blood. Describe in brief with indications. 15
- Q.3 Long Answer Type 10x2=20
- a) Importance of cellular therapy with its indication
  - b) Newer methodology in transfusion medicine to prevent Transfusion transmitted infection
- Q.4 Short Notes (any 4 out of 6) 4x5=20
- a) Eligibility of apheresis donor
  - b) Granulocyte Concentrate
  - c) Single Donor Platelet
  - d) Irradiation
  - e) Indication of Double Cascade Plasmapheresis
  - f) Swirling test