

TRANSFUSION TECHNOLOGY

BLOOD GROUPS :

ESSAY

- 1 Explain the inheritance of ABO and Rh system. Add a note on blood group antigens.
 - Introduction and discovery of blood group system and mention mendelian law of inheritance
 - Inheritance of ABO system with diagram
 - Inheritance of Rh system with diagram
 - List and briefly explain blood group antigens
 - A, B,H antigens in ABO blood group system
 - C,c,D,E,e and D^U in Rh blood group system

- 2 Discuss ABO blood grouping methods and factors influencing it.
 - Introduction of ABO blood group
 - Antigens and antibodies
 - Grouping methods - cell and serum grouping including slide, tube, ID microtype, microplate methods
 - Mention factors - zeta potential, cell serum ratio, pH, centrifugation, temperature, enzymes, LISS, AHG, etc...

- 3 Discuss on blood grouping and its inheritance. Add a note on laws of heredity.
 - General Introduction to Blood Grouping and its discovery
 - Different blood group systems
 - Inheritance - chromosome no:, genotype, phenotype , draw a pedigree chart
 - Description of laws of heredity - Mendelian law of inheritance

- 4 Describe in detail different methods of ABO grouping
 - Introduction of ABO blood group
 - Antigens and antibodies

- Grouping methods - cell and serum grouping including slide, tube, ID microtype, microplate methods
 - Draw the picture of column gel agglutination and microtiter plates
- 5 Discuss forward and reverse blood grouping. How will you resolve a case of ABO discrepancies(7+3=10)
- Introduction of ABO blood group
 - Antigens and antibodies
 - Grouping methods - cell and serum grouping including slide, tube, ID microtype, microplate methods - with diagram
 - Describe discrepancies - technical factors and individual factors
 - Example and resolving methods
- 6 Discuss cells of immune system. Add a note on complement in transfusion medicine
- List cells of immune system
 - Briefly explain each with diagram
 - Write note on complements in transfusion medicine
- 7 Discuss on general methods of antigen antibody detection
- Definition and properties of antigen
 - Definition and properties of antibody
 - General methods of antigen antibody detection in detail - including sensitization, agglutination, hemolysis, neutralization etc..
- 8 Define Rh blood group system and different methods of Rh typing.
- Definition and discovery
 - Inheritance - Chromosome, genotype and phenotype
 - Antigens - (C,C,D.E.e and derivatives of D antigens)
 - Antibodies
 - Clinical significance - in transfusion reaction and HDN
 - Method of detection - slide, tube, Id microtype, microplate
 - Mention weak D
- 9 List Different minor blood group systems. Describe briefly on private blood groups and Bombay blood group
- Enumerate different minor blood groups (MNS, kell, duffy, Kidd, Lutheran ,P etc..)

- Miscellaneous Blood Groups (I, Diego ..)
 - Private blood groups importance
 - Bombay and para Bombay blood Group
- 10 Discuss on minor blood group system .Add a note on the DuAntigen and its importance
- Different minor blood group systems(MNS, kell, duffy, Kidd, Lutheran ,P etc..)
 - Brief explanation each (importance,clinical significance)
 - Explain features and clinical importance with detection method of **D^u**
- 11 Describe the preparation and use of enzyme treated red cells in blood grouping methods. Add a note on different sub groups and method of detection
- Introduction on blood group and methods of grouping
 - Description About Enzymes Treated red cells in blood banking.
 - Uses And Importance
 - ABO subgroups (A1,A2,A1B, A2B , BX, Bm etc.. and methods of detection)
- 12 Discuss About Secretors And non secretors. Briefly Explain Secretary status
- Definition of secretors and non secretors - properties, genes, genotypes,
 - Describe the detection method by using saliva in detail

SHORT NOTES (5/3 marks)

- 1 Red blood cell antigens
- Introduction on blood group
 - A, B H antigens including subgroups
 - Rh antigens (C,C,D.E.e and D^U)
 - Minor blood group antigens
 - Antigenicity
 - Clinical importance
- 2 Mandelian's law of inheritance
- Introduction on blood group
 - Genotype and phenotype
 - Law of heredity

- The law of segregation (4 parts)
 - The law of independent assortment.
- 3 If father is AB and mother is O, what are possible genotype of the children
- Introduction on blood group
 - Genotype and phenotype
 - Law of heredity - Mendelian Law
 - Draw a pedigree chart with AB father and O group mother
- 4 ABO antigen and encoding genes
- Introduction on blood group
 - Genotype and phenotype
 - Chromosome and genes - A gene , B gene and H gene
 - Formation of antigens with diagrammatic representation
- 5 Define the term affinity and avidity of antigen-antibody reactions
- Antigen antibody reaction,
 - Explain affinity and avidity with diagram
- 6 Variants of A blood group and its significance
- Mention about blood Group A and AB
 - Subgroups - A1, A2, A1B and A2B
 - Significance in transfusion
- 7 Bombay phenotype****
- Define bombay group (hh or Null)
 - Diagram including development of antigen and defect in gene
 - Properties
 - Clinical importance
 - Para bombay group
- 8 Antigen Antibody reactions
- Definition and properties of antigen and antibody
 - General methods of antigen antibody detection in detail - including sensitization, agglutination, hemolysis, neutralization etc..
 - Enumerate the factors affecting Ag - Ab reaction

- 9 Complement System
 - Definition of complements - mention pathways
 - Importance in blood transfusion

- 10 Factors affecting antigen antibody reaction
 - Mention different type of antigen antibody reactions and its importance
 - Factors affecting antigen - antibody reactions - zeta potential, cell serum ratio, pH, centrifugation, temperature, enzymes, LISS, AHG, etc...

- 11 Reverse grouping
 - Serum grouping with diagram
 - Method of detection (slide, tube, id micro typing, microplate)
 - A chart of possible interpretation

- 12 Clinical significance of red cell antigen other than ABO
 - Introduction on blood group
 - Rh antigens (C,C,D,E.e and D^U)
 - Minor blood group antigens
 - Antigenicity
 - Clinical importance

- 13 What is Rh factor and mention its significance
 - Rh blood group system - discovery
 - Inheritance - Chromosome, genotype and phenotype
 - Antigens - (C,C,D,E.e and derivatives of D antigens)
 - Antigenicity
 - Antibody production
 - Clinical significance - in transfusion reaction and HDN

- 14 Rh antibodies
 - Rh blood group system - discovery
 - Inheritance - Chromosome, genotype and phenotype
 - Antigens - (C,C,D,E.e)
 - Antigenicity
 - Antibody production immune incomplete Ab, and their properties
 - Clinical significance - in transfusion reaction and HDN

- 15 D antigen OR Du (weak D testing)**
- Rh blood group system - discovery
 - Inheritance - Chromosome, genotype and phenotype
 - Antigens - (C,C,D.E.e)
 - Features of D antigens and their variants with properties and clinical importance
 - Detection method of **D^u**
- 16 Dangerous O group
- Introduction of blood group A, B, O and AB
 - Explain the antigen and antibodies (antiA and Anti B) in O blood group - universal donors
 - Mention the titre of antibody and its detection methods
 - Clinical importance of O group
- 17 Blood group system other than ABO blood group system
- Introduction on blood group
 - Bombay blood group
 - Minor blood group (MNS, kell, duffy, Kidd, Lutheran ,P etc..)
 - Clinical importance
- 18 Secretors and non secretors
- Definition of secretors and non secretors - properties, genes, genotypes,
 - Describe the detection method by using saliva in detail
- 19 MNS blood group system
- Discovery
 - Antigens
 - Properties
 - Antibody
 - Clinical importance
- 20 Kell blood group system
- Discovery
 - Antigens
 - Properties
 - Antibody

- Clinical importance
- 21 Duffy blood group system
- Discovery
 - Antigens
 - Properties
 - Antibody
 - Clinical importance
- 22 Kidd blood group system
- Discovery
 - Antigens
 - Properties
 - Antibody
 - Clinical importance
- 23 Lewis blood group system OR Lewis antigen*
- Discovery
 - Antigens
 - Properties
 - Antibody
 - Clinical importance
- 24 Name four method of blood grouping
- Introduction of ABO blood group
 - Grouping methods - cell and serum grouping including slide, tube, ID microtype, microplate methods
 - Draw the picture of column gel agglutination and microtiter plates
- 25 ABO discrepancies
- Describe discrepancies - technical factors and individual factors
 - Example with resolving methods
- 26 Acquired B antigen
- Introduction to ABO discrepancies

- Formation of Acquired B antigen - including biochemistry of A and B antigen formation
 - Clinical importance
 - Resolving methods
- 27 Importance of IgM, IgG and IgA antibodies in immunohematology
- Define antibody and describe the basic structure and properties
 - Explain IgM , IgG and IgA antibodies with diagram
 - Importance of each Abs in blood banking .
- 28 Naturally occurring and immune antibodies in ABO blood group system
- Explain naturally occurring antibodies (IgM type)with general properties with example (ABO antibodies)
 - Immune antibodies - Rh , kell, and other minor blood group antibodies - IgG type
- 29 Blood grouping antisera
- Introduction on blood grouping
 - Antiseras - AntiA, antiB, anti D, antiH, antiA1 lectin
 - Types - polyclonal, monoclonal , blend
 - Preparation of lectin
- 30 Lectin
- Introduction on blood grouping antisera
 - antiH, antiA1 lectin
 - Preparation of lectin from Dolichos biflorus and Ulex europaeus
 - Use
- 31 Prozone Phenomenon.(3)
- Antigen antibody ratio (1:2)
 - Excess antibody titre
 - Diagrammatic representation
 - Note down its significance in antigen antibody reactions
- 32 Zeta Potential (3)
- Define zeta potential
 - Reason for RBC repulsion

- Its importance
- Method for reducing zeta potential

33 Autoagglutination (3)

- Define auto agglutination and its significance in tests performed in blood bank
- Reason for auto agglutination
- Autoantibodies – Warm and Cold antibody
- Detection methods

BLOOD DONATION AND DONOR SCREENING

ESSAY

- 1 Describe in detail about lab tests done for voluntary donors and explain in detail about the storage and issuing of blood components(10)
 - Introduction of blood donors and mention types of donors
 - Lab test - registration , questionnaire, routine health check up (Height weight, blood pressure , Hb estimation etc..)
 - Enumerate different blood components and their storage temperature and other required conditions .
 - Mention about issuing of a blood component -

SHORT NOTES (5/3 marks

- 1 Materials and methods for blood collection in blood bank from Blood donors.
 - Introduction of blood donors
 - Requirements for blood collection - premises, equipments, personnel etc..
 - Selection and cleaning of phlebotomy site
 - Method of collection
 - Post donation care
- 2 Hemoglobin estimation of blood donors(5/3)**
 - Mention about donors and donor selection
 - Hb detection, - specific gravity method, Cyanmeth Hb estimation, automated analyser, hemocue etc....

- 3 Copper sulfate method of Hb screening(5/3)***
 - Introduction - importance of Hb estimation in donors including normal value
 - Enumerate the methods of Hb detection
 - Describe in detail about copper sulphate method
 - Principle
 - Requirements and preparation of copper sulphate solution
 - Interpretation

- 4 Adverse donor reaction (5/3)
 - Introduction about donors
 - Adverse reactions - types and management

- 5 Donor deferral
 - Introduction of blood donor
 - Donor selection
 - Reason for donor deferral (temporary and permanent)

- 6 List the reason for permanent in deferral in blood donation(3)
 - Introduction about Donors and Donor selection
 - Reason for permanent Deferral - transfusion transmitted diseases, cardiovascular problems, liver cirrhosis, CKD, etc...

- 7 Lists the reason for temporary deferral in blood collection(3)
 - Introduction about Donors and Donor selection
 - Reason for temporary Deferral and the period of deferral - recent donation, vaccination, tattoo, minor / major surgery, pregnancy, use of alcohol etc....

- 8 Autologous donation OR Autologous blood donors(5/3)
 - Define autologous blood donation
 - Importance and indications
 - Selection criteria
 - Types of autologous donation/ transfusion
 - Leap frog technique

- 9 Strategies for blood donor motivation(3)
 - Introduction of blood donation

- Types of donors
 - Importance of blood donation
 - Advantage of donation
- 10 Organization of blood donation camps(5)
- Introduction of blood donation and importance
 - Requirement for conducting a blood donation camp
 - Describe about facilities - premises, personnel, equipment, transportation
- 11 Selection of blood donors (5/3)
- Introduction of blood donors and mention types of donors
 - Donor selection process registration, questionnaire, routine health checkup (Height weight, blood pressure , Hb estimation etc.
- 12 Voluntary blood donors (3)
- Define blood donation and blood donors
 - Types of donors
 - Describe about voluntary donor and their importance in BTS
 - Selection of donors
- 13 Blood donation request form / questionnaire (3)
- Define blood donation and blood donors
 - Features of a requisition form
 - Contents in a questionnaire

APHERESIS

ESSAY

- 1 What is apheresis technique? Method of apheresis and describe in detail about plasmapheresis or (plateletpheresis or leukapheresis or Therapeutic apheresis)
- Introduction
 - Indications
 - Methods - cytappheresis, (plasmapheresis, therapeutic apheresis..)
 - Manual and automated method (IFC and CFC)
 - Plasmapheresis / plasma exchange

- Indications
- Plasmapheresis donors
- Replacement fluids
- Complications
- Plateletpheresis
 - Platelet apheresis donors
 - Technique
 - Indications
- Leukapheresis
 - Introduction
 - Leukapheresis donors
 - Technique
 - Method for increasing leukocyte yield
 - Indications
- Therapeutic apheresis
 - Definition , types
 - Therapeutic redcellphersis
 - Therapeutic plasmapheresis/thrombopheresis
 - Therapeutic leukapheresis
 - Neocytapheresis
 - Photopheresis

SHORT NOTES

- 1 Apheresis (5/3)**
 - Introduction (1)+ techniques and methods(1)+ note down the types of apheresis and their indications (3)
- 2 Plasmapheresis (5/3)**
 - Indications (1) +Plasmapheresis donors(1) + Technique (1) + Replacement fluids (1) + Complications.
- 3 Leukapheresis (5/3)*
 - Introduction + Leukapheresis donors +Technique + Method for increasing leukocyte yield+ indications

- 4 Donor plasmapheresis (3)*
- 5 Plateletpheresis/ thrombopheresis
 - Platelet apheresis donors +Technique + Indications
- 6 Donor plateletpheresis (3)*
- 7 Apheresis techniques (5/3)
- 8 Therapeutic apheresis (5/3)
 - definition, types, mention about Therapeutic redcellphersis, Therapeutic plasmapheresis, therapeutic thrombopheresis, Therapeutic leukapheresis, Neocytapheresis, Photopheresis
- 9 Neocytaphersis (3)
- 10 Photopheresis (3)

COLLECTION, PRESERVATION AND STORAGE OF BLOOD

ESSAY

- 1 Enumerate and discuss the types of blood bags in present day use. Mention the anticoagulant used in blood bank with their advantages(5+5=10)
 - Introduction of blood donation and blood collection
 - List of different types of blood bags - single, double , triple, quadruple , top and bottom bag (optipac), bag with filters etc...
 - Describe about the features of blood bag - material, labeling, capacity,
 - List out the anticoagulant and additives with volume
 - Components in anticoagulant solution and use of each content
 - Advantages
- 2 What are the anticoagulants used in blood transfusion? Discuss the composition and advantages of each (3+7=10)
 - Define anticoagulant
 - Enlist the types of anticoagulant used in blood bank
 - Composition of each anticoagulant with amount
 - Use of each content
 - Advantages

- Note on additive solutions

SHORT NOTES

- 1 Anticoagulant solutions used for blood transfusion(5)**

OR

Anticoagulant preservative solutions used in blood bank (5)

- Define anticoagulant
 - Enlist the types of anticoagulant used in blood bank
 - Composition of each anticoagulant with amount
 - Use of each content
 - Advantages
- 2 Note on additive solutions (5/3)***
- Introduction - blood collection and blood bag
 - Mention anticoagulant and its use with shelf life of component
 - Describe additives and its use
 - Types with examples - RBC additive solution and Platelet additive solutions
 - Advantages
- 3 Temperature storage of different components of blood (5/3)**
- Introduction of blood components
 - Importance of proper storage and refrigeration
 - Chart of different blood component storage temperature with shelf life
- 4 Storage lesions of blood(5/3)**
- Introduction of blood components and their storage
 - Storage temperature and shelf life
 - Storage of whole blood and PRBC
 - Storage lesion - physical and chemical lesions
- 5 RBC additive solutions(5/3)**
- Introduction of blood component
 - Describe packed red cells and shelf life in different anticoagulant
 - Write down additive solution with examples (SAGM)
 - Constitution and advantages

- 6 CPDA anticoagulant(3)**
 - Define anticoagulant
 - Constitution and function of each content
 - Types - CPDA1 and CPDA2
 - Use and advantages

- 7 Blood collection bags (5/3)**
 - Introduction of blood collection in blood bank
 - Describe about the features of blood bag - material, labeling, capacity
 - List of different types of blood bags - single, double , triple, quadruple , top and bottom bag (optipac), bag with filters etc...
 - Advantages

- 8 Preparation of donor phlebotomy site (3)
 - Introduction of blood collection and blood donors
 - Describe the requirements and method of cleaning and preparation of phlebotomy site

- 9 List the information that is required to be on the blood unit label (3)
 - Introduction on blood bag unit and labeling and its importance
 - Informations on blood unit label -component name, ID number, volume, expiry , blood group, date, etc..

- 10 Discuss Collection And Storage of blood samples for blood grouping. Add a note on storage of serum and preservation red cells

- 11 Transportation of blood (5/3)
 - Introduction of blood and blood components
 - Importance of preservation of all components
 - Refrigeration at different temperature
 - Errors in transportation

- 12 International colour coding of blood labels (5 or 3) ***
 - Introduction on blood bag unit and labeling and its importance
 - Its color coding based on blood group
 - Group A- yellow, group B- Pink , Group O - Blue , Group AB - White

LOOD COMPONENT SEPARATION / BLOOD COMPONENT THERAPY

- 1 What are the advantages of blood components? Describe in detail about various blood components, its preparation, storage, and use(3+7=10)
 - Introduction of blood component therapy and its importance
 - Advantages
 - Different blood components- whole blood, PRBC, PRP, PPP, FFP, Platelet concentrate , Cryoprecipitate, irradiated blood components, granulocyte concentrate
 - Mention preparation, storage and use of each components

- 2 Describe in detail on preservation of RBCs in glycerol and liquid nitrogen
 - Introduction of long time storage of packed red cells
 - Preparation of packed red cells
 - Glycerolization - in 40% and 20% v/v
 - Freezing technique with liquid nitrogen
 - Deglycerolization technique
 - Advantage of the method

- 3 What is blood component therapy and its importance ? Describe in detail about v preparation, storage and indication of any one of the blood component (It may be specifically asked)
 - Introduction of blood component therapy and its importance
 - Preparation by different methods
 - Storage and preservation , shelf life
 - Issuing
 - Dosage and administration
 - Indications

- 4 Principles of preparations of blood components from one unit whole blood (5/3)
 - Blood component separation and its importance
 - Different method
 - Describe the preparation of components with the help of a neat flowchart

- 5 Components of blood (3)

- Introduction and constitution of blood
 - Cellular and plasma content
 - Function and use of each content
 - Mention the component separation methods
- 6 Refrigerated centrifuge (3)
- Blood component separation and its importance
 - Mention heavy spin and light spin
 - Properties and parts of a refrigerator centrifuge
 - Its use and advantages
- 7 Packed red cells (5) OR Indications for red cell transfusion(3)
- Introduction to blood component therapy
 - Packed red cell preparation - different methods
 - Storage and shelf life
 - Indications
 - Dosage and administration
 - QC
- 8 What are the plasma components for transfusion OR Storage of plasma(5) OR plasma derivatives
- Blood component separation and its importance
 - Preparation of components (flowchart)
 - Preparation methods- centrifugation / apheresis
 - Preparation of PPP, PRP, FFP, immunoglobulins , coagulation factors FVIII, FIX concentrate etc....
- 9 Fresh Frozen Plasma (FFP)
- Blood component separation and its importance
 - preparation of components (flowchart)
 - Preparation methods
 - Storage and shelf life
 - Indications
 - Composition of FFP
 - Dosage and administration

- QC
- 10 Platelet rich plasma (5)
- Blood component separation and its importance
 - preparation of components (flowchart)
 - Preparation methods - light spin
 - Preparation of platelet concentrate
 - Indications and use
- 11 Platelet concentrate OR Methods of platelet preparation (3) OR Storage of platelet concentrate (3)
- Blood component separation and its importance
 - preparation of components (flowchart)
 - Preparation methods
 - Storage and shelf life
 - Indications
 - Dosage and administration - Platelet refractoriness
 - QC - platelet count, pH, swirling etc...
- 12 Leukoreduction / leucodepletion (5)
- Blood component separation and its importance
 - Preparation of leucodepleted red cells and other blood products
 - Preparation methods - buffycoat method , filtration, using optipac, irradiation etc...
 - Storage and shelf life
 - Indications
- 13 Cryoprecipitate (5 /3)***** OR Indication of cryoprecipitate OR Use of cryoprecipitate (3)*
- Introduction to blood component therapy
 - Cryo precipitate preparation methods
 - Constituents in cryoprecipitate
 - Storage and shelf life
 - Indications
 - Dosage and administration
- 14 F VIII concentrate

- One of the important plasma derivative
 - Brief description with indications.
- 15 Prothrombin complex concentrate
- One of the important plasma derivative
 - Brief descriptions with indications
- 16 Irradiated blood components(3)
- Introduction for irradiation
 - Indication
 - Method of irradiation
 - Shelf life after irradiation
- 17 17. Washed RBC (5/3)
- Introduction - blood components
 - Preparation of washed RBC - instruments used
 - Indication
 - Storage

TESTS PERFORMED IN BLOOD BANK

- 1 What is compatibility testing? Describe in detail about the steps involved. Add a note on Coomb's test
 - Define compatibility testing/ pre transfusion testing
 - Significance
 - Different steps - describe each
 - Describe about coomb's test - DCT, and ICT
- 2 Mention briefly the significance of cross matching. Describe in detail about various methods of cross matching(3+7=10)
 - Introduction to compatibility testing and its importance
 - Different Cross matching method - major and minor
 - Enzymatic method. Centrifugation method etc..
 - Requirements and procedure
 - Interpretation and issuing of blood

- 3 Describe compatibility test in blood transfusion. add a note on special problems in compatibility
 - Definition
 - Describe in detail about each step - history of individuals, blood grouping , identification of irregular antibody , coombs test, cross matching
 - Compatibility Testing Methods in urgent and non urgent cases.
 - Explain The Special Problems in compatibility

- 4 Explain crossmatching in detail. Add a note on serological tests on donor blood
 - Introduction to compatibility testing and its importance
 - Different Cross matching method - major and minor
 - Enzymatic method. Centrifugation method etc..
 - Requirements and procedure
 - Interpretation and issuing of blood
 - Serological tests- describe all TTD detection tests, antiglobulin test, antibody screening

SHORT NOTES (5/3 MARKS)

- 1 Coomb's test (5)***
 - Introduction
 - Principle - with diagrammatic representation
 - Direct and Indirect coomb's test - method
 - AHG antisera
 - Use , significance

- 2 Indirect antiglobulin test (3/5)**
 - Introduction
 - Principle with diagram - invitro
 - Method / procedure
 - AHG antisera
 - Use, significance (HDN, incompatible transfusion)

- 3 Direct antiglobulin test (3/5)**
 - Introduction

- Principle with diagram - invivo
 - Method / procedure
 - AHG antisera
 - Use , significance (HDN, incompatible transfusion)
- 4 Preparation and use of AHG (3)
- Introduction to Coombs test
 - Anti human globulin
 - Preparation from immunized rabbit brain with human globulin
 - Coloring agent
- 5 Complete and incomplete antibodies (3)
- Introduction to antibodies
 - Mention complete and incomplete antibodies with example
 - Detection by coomb's test
- 6 Antibody titration (5) **
- Introduction to antibody and its concentration/ titre
 - Mention high titre O group
 - Detection method by serial dilution
 - Interpretation
 - Application
- 7 Antibody screening
- Introduction to blood group antibodies
 - Irregular antibodies
 - Identification by using cell panel (3 or 7 or 11 cell panel)
 - Titre of antibody
 - Clinical importance
- 8 Cross matching (5)** OR Major and minor cross matching(5)
- Introduction to compatibility testing and its importance
 - Different Cross matching method - major and minor
 - Requirements and procedure
 - Interpretation and issuing of blood

- 9 Preparation of IgG coated cells / preparation of sensitized red cells (3)
 - Introduction of tests performed in blood bank
 - Use of IgG coated cells
 - Preparation - using antiD

- 10 Grading of agglutination (3)
 - Define Agglutination
 - Antigen - antibody reaction - principle
 - Grading - 1+, 2+,3+, 4+ and MF agglutination with diagram
 - Grading of agglutination in ID micro typing system

- 11 What is titre? How do you determine Anti-D titre in a pregnant mother(3)
 - Introduction to antibody and its concentration/ titre
 - Detection method by serial dilution
 - AntiD in pregnant women
 - Indication - mention about Rh HDN
 - Interpretation

- 12 LISS and its use in blood bank OR Low ionic strength saline (3)
 - Define LISS
 - Composition and preparation
 - Use
 - Advantages

HEMOLYTIC DISEASE OF NEWBORN

ESSAY

- 1 What is HDN? write down the types of HDN, pathogenesis, laboratory diagnosis and management of Rh HDN (1 +1+3+3+2 = 10 marks)
 - Introduction , types- Rh and ABO HDN ,
 - Pathogenesis: foetal maternal hemorrhage and IgG Ab , Events and complications in foetus (hydrops fetalis, anemia, kernicterus)
 - Diagnosis: in mother(antenatal) and in newborn (post natal)

SHORT NOTES (5/3 Marks)

- 1 ABO haemolytic disease of newborn (5)*
 - Introduction and etiology
 - Lab diagnosis in mother and foetus
 - Management

- 2 Rh haemolytic disease of foetus and newborn (5/3)**
 - Introduction
 - Pathogenesis: foetal maternal hemorrhage and IgG Ab , Events and complications in foetus (hydrops fetalis, anemia, kernicterus)
 - Diagnosis: in mother(antenatal) and in newborn (post natal)

- 3 Haemolytic disease of newborn (5)***
 - Introduction , types- Rh and ABO HDN ,
 - Rh HDN
 - Pathogenesis: foetal maternal hemorrhage and IgG Ab , Events and complications in foetus (hydrops fetalis, anemia, kernicterus)
 - Diagnosis: in mother(antenatal) and in newborn (post natal)
 - ABO HDN

- 4 Exchange blood transfusion (3)*
 - Define exchange transfusion
 - Clinical importance - HDN
 - Selection of blood
 - Method of transfusion
 - Advantages

- 5 What is antibody titre? how to determine Anti D titre in pregnant women(3)*
 - Titre : Concentration of Ab,
 - Mention about Rh HDN -
 - Method to detect Ab titre (repetition in titre if it is above 1:32)

TRANSFUSION REACTIONS

- 1 List transfusion reactions. Discuss the different types of haemolytic transfusion reactions (10)
 - Definition
 - Classification - Hemolytic or non hemolytic Or Acute or delayed
 - Describe each type of transfusion reaction in detail mention complications and management

- 2 Classify transfusion reactions. How will you investigate a case of transfusion reactions (7+3=10)**
 - Definition (1)
 - Classification - Hemolytic or non hemolytic Or Acute or delayed (2)
 - Briefly explain each type (4)
 - Method of investigation on pre and post transfusion blood and urine sample (3)
 - Patient history, and details of transfusion
 - Detection of hemoglobin, bilirubin, haptoglobin
 - Compatibility tests, DCT, ICT, antibody screening, gramsatining, blood culture

- 3 Define acute transfusion reactions and describe basic working up and testing (10)
 - Definition (1)
 - Classification - Hemolytic or non hemolytic Or Acute or delayed (2)
 - Briefly explain each type (4)
 - IMMUNE : FNHTR, Anaphylactic, TRALI, Hemolytic reactions(chemical or physical destruction), urticaria
 - Method of investigation on pre and post transfusion blood and urine sample (3)
 - Patient history, and details of transfusion
 - Detection of hemoglobin, bilirubin, haptoglobin
 - Compatibility tests, DCT, ICT, antibody screening, gramsatining, blood culture

- 4 Leukocyte antigen (3)***
 - Importance of antigen in blood transfusion
 - HLA and its significance
 - GVHD
 - Methods of detection

- 5 Delayed haemolytic transfusion reactions(5)
 - Definition(1)
 - Classification - Hemolytic or non hemolytic Or Acute or delayed (2)
 - Delayed type (2)
 - IMMUNE: Hemolytic transfusion reaction (anamnestic response), post transfusion purpura, air embolism, GVHD
 - NON IMMUNE: TTD, septicemia, iron overload,

- 6 Haemolytic transfusion reactions (5)
 - Definition (1)
 - Classification - Hemolytic or non hemolytic Or Acute or delayed(2)
 - Hemolytic reactions: intravascular and extravascular (2)

- 7 Pyrogens (3)*
 - Define pyrogen
 - Role in transfusion reaction or in TTD
 - Etiology
 - Detection and Management

- 8 Graft versus host disease (5)*
 - Definition (1)
 - Pathogenesis - due to leukocyte antigens → CD4 CD8 cells act against host cell antigens → lead to complications in GIT, skin, Liver etc → development of related complications and clinical features (2)
 - Complications (1)
 - Management (1)

- 9 Anaphylactic transfusion reactions(3)*
 - Introduction on transfusion reaction and types
 - Explain anaphylactic reaction
 - Etiology and pathophysiology
 - Management

QUALITY CONTROL IN BTS

- 1 Quality assurance in blood banking (5)**
 - Definition of QA
 - Describe briefly about QA personnel, premises, blood collection and processing, equipment, reagents, blood components etc...
- 2 QC of grouping reagent used in blood bank(5/3)**
 - Define QC and its importance
 - Brief introduction of reagents and its use
 - General principle of QC of reagents -
 - QC of Anti A, Anti B, Anti AB, Anti D, AHG etc..
- 3 Quality assessment of Anti-A (5)
 - Define QC and its importance
 - Brief introduction of ABO reagents : polyspecific, monospecific, IgG, IgM, IgG+IgM blend,
 - General principle of QC of reagents -
 - QC of Anti A - specificity, potency, batch to batch consistency, appearance etc
- 4 Quality control of ABO reagent (5)
- 5 SOP in blood banking (5)*
 - Define SOP
 - Importance
 - Formulation Of SOP
 - Use of SOP in different areas of BTS
- 6 Enumerate records to be maintained in blood bank (3)

TRANSFUSION TRANSMITTED DISEASES

ESSAY

- 1 Mention mandatory transfusion transmitted screening tests in blood banks. Discuss the different types and principle of ELISA (Enzyme Linked ImmunoSorbent assay (10)

- 2 Enumerate the Transfusion transmitted diseases. Explain In detail about etiology, pathogenesis, and diagnostic methods of any one of them (may be asked specifically- HIV, Hepatitis, malaria, syphilis, CMV etc...)

SHORT NOTES (5/3)

- 1 Lists the major diseases transmitted through transfusion (3)
- Different transfusion transmitted diseases.
 - Brief description of each
 - Screening Test(principle and test procedures)
- 2 Infectious disease screening in blood bank (5)
- Different transfusion transmitted diseases.
 - Brief description of- HIV, Hepatitis, syphilis, malaria, CMV etc...
 - Principle and test procedures of common and specific diagnostic tests
- 3 ELISA OR Merit and demerits of ELISA test (3)
- Describe ELISA and its application
 - Different types
 - Explain the principles with Diagram
 - Merit and demerit
- 4 Malaria (5) OR Transfusion transmitted malaria (3) OR Methods of screening of blood for malaria (3)
- 5 Tests for detection of syphilis (5)
- Explain etiology-
 - Pathogenesis
 - Diagnostic method
- 6 Lists of parasitic infection transmitted through blood transfusion (3)
- 7 CMV transmission through transfusion (3)
- 8 Significance of HBSAg in transfusion (3)
- 9 Window period (3)

TRANSFUSION METHODS

- 1 Define transfusion. Describe the types of transfusion and special procedures in transfusion(5)
- 2 Massive transfusion (3)
- 3 Autologous transfusion (5)
- 4 Exchange transfusion (3)

AUTOMATION AND RECENT ADVANCES IN BLOOD TRANSFUSION

- 1 Discuss about automation and recent advances in blood banking (10)
 - Introduction to blood bank
 - Briefly explain the organization and management of blood banking
 - Explain automation and recent advances in each area
 - Donor registration - QR code system and software
 - Donor selection - automated hb detection method
 - Automated method in blood collection - robotic blood collection, IR vein identifying system
 - Automation in serological methods-
 - Flow cytometry
 - Automation in blood component separation - apheresis
- 2 Flow cytometry (5)
 - Introduction
 - Principle with neat labeled diagram
 - Application
- 3 Column agglutination OR ID micro typing system Or Gel card method (3)
 - Introduction to tests performed in blood bank
 - Principle with diagram
 - Content in gel card
 - Agglutination reaction interpretation and grading
 - Advantages and disadvantages
- 4 Optipress (3)

- Semi automated system for leucodepleted RBC preparation
 - Working
 - Features of optipac
 - Advantages
- 5 Cell washing Machine (3)
- Preparation of washed RBC
 - Enlist the machines
 - Usand advantages
- 6 Apheresis machine
- Define apheresis and types
 - Explain Principe - IFC and CFC
 - Enlist the machines with features

MISCELLANEOUS QUESTIONS

- 1 Rouleaux (3)
- Define rouleaux formation -
 - Mention the conditions
 - Reason for false positive case
 - Effect in interpretation of agglutination reaction
- 2 Biosafety precautions in blood bank (5) OR Suggestion to minimize infectious hazards in lab (5)
- Define biosafety
 - Infectious hazards in blood bank
 - Occurrence of infectious hazards - at the time of collection, processing storage, diagnosis of TTD preventive measures to minimize infectious hazards
- 3 General guidelines for storing and handling chemicals and electrical equipments
- Introduction of blood bank
 - List out the reagents, chemicals and electrical equipments in use
 - Explain guidelines and handling of each
- 4 Autoagglutination (3)

- Define auto agglutination and its significance in tests performed in blood bank
- Reason for auto agglutination
- Autoantibodies – Warm and Cold antibody
- Detection methods