PROFESSIONAL BOARD FOR
MEDICAL TECHNOLOGY

SYLLABUS

IMMUNO-HAEMATOLOGY

MEDICAL TECHNOLOGIST

EFFECTIVE JAN 2020 FOR EXAMS FROM MARCH 2021

CONTENTS

INTRODUCTION

Learners need to be registered as medical technology interns with the HPCSA for a period of 12 months. Students are able to write the examination after 12 months. Students can be registered for a period of 3 years enabling them to write the examination a maximum of 4 times. Mandatory training includes theoretical, practical training and rotation through the various laboratories.

All modules in this syllabus are underpinned by ethics and professionalism.

SECTION ONE
STATUTORY REGULATIONS

On completion of this section the learner must understand and apply the requirements described in:

- Standards for the Practice of Blood Transfusion in South Africa – current edition
- Clinical Guidelines for use of blood and blood products - current edition
- Occupational Health and Safety Act (OHS. Act)
- National Health Act
- National Road Act (i.e. transport & spillage of blood and blood products)
- International Air Transport Association Regulations (i.e. transport & spillage of blood and blood products)
- Regulations and guidelines as set out by the Health Professions Council of South Africa (HPCSA)
- Health Professions Act
- Protection of Personal Information Act (POPI)

SECTION TWO
ETHICS AND PROFESSIONALISM

On completion of this section the learner must explain and apply the concepts of:

- Core principles of Medical Ethics
- Business ethics
- Confidentiality
- Informed consent
- Documentation of Laboratory Results
- Code of conduct as prescribed by the HPCSA

SECTION THREE
CUSTOMER SERVICE

On completion of this section the learner must be able to:

- Identify internal and external customers
- Describe and apply the concepts of good customer service

- Discuss the impact of good and poor customer service

SECTION FOUR
SAFETY, HEALTH & ENVIRONMENT (SHE)

On completion of this section the learner must understand the principles of:

- Safety, Health and Environment (as per the O.H.S Act)
- Classification, segregation and disposal of waste (Biohazardous, sharps and general)
- Decontamination of equipment
- Personal protective equipment (PPE)
- Safety procedures

SECTION FIVE
LABORATORY EQUIPMENT

On completion of this section the learner must:

- Demonstrate knowledge of the principle of operation of the following equipment:
  Centrifuges
  Thermometers
  Laminar Flow Cabinets
  Pipettes
  Waterbaths/dry baths
  Refrigerators
  Deep freezers
  Processing equipment
  Scales/Balances
  Automated equipment
- Discuss the advantages and disadvantages of an automated equipment
- Demonstrate how to troubleshoot in the case of problems with the above
- Demonstrate knowledge of maintenance and calibration schedules for equipment

SECTION SIX
BLOOD COLLECTION

On completion of this section the learner must:

- Describe the criteria for protection of the donor and recipient as indicated in the Standards for the Practice of Blood Transfusion in South Africa
- Describe the methods for collection:
  Allogeneic donations
  Apheresis donations including Stem cell collection and storage
  Autologous donations
  Designated/directed donations
- Explain indications for therapeutic phlebotomy
- Describe blood collection containers

- Explain anticoagulant and preservative solutions and their role in blood storage
- Explain the risks associated with blood donation

SECTION SEVEN
DONATION TESTING

On completion of this section the learner must be able to:

7.1 Explain techniques for:
- Blood grouping (ABO & Rh)
- Antibody screening and identification
- Titre tests for ABO antibodies
- Confirmation testing as required

7.2 Explain the principles for:
- Enzyme-Linked Immunosorbent Assay (ELISA)
- Chemiluminescence
- Nucleic Acid Testing (NAT)
- Polymerase chain reaction (PCR)
- Treponema Pallidum Haemagglutination Assay (TPHA)
- Venereal disease research laboratory (VDRL)

7.3 Interpret and report on results for all of the above

Automated testing

Note: For the purpose of this section, information on automated blood grouping machines must be made available to the learners. Learners must observe the basic principles of operation and function of automated blood grouping machines. This should include:

Sample preparation

On completion of this section, the learner must:

7.4 Be able to discuss suitability of samples for testing

Operation

On completion of this section, the learner must be able to:

7.5 Describe the daily operating procedures

7.6 Describe the routine maintenance of the machine

Reagents

On completion of this section, the learner must:

7.7 Discuss the various reagents and dilutions used in the blood grouping machines

Controls

On completion of this section, the learner must:

7.8 Understand what routine controls are necessary for the blood grouping machine

Interpretation and validation of results

On completion of this section, the learner must be able to:

7.9 Interpret results and identify anomalies
7.10 Identify weak expression of antigens
7.11 Validate and verify results

Troubleshooting
On completion of this section the learner must:
7.12 Demonstrate knowledge of the troubleshooting approaches related to the operating manual with the aim to solve problems

Transfusion transmitted infections

Principles
On completion of this section, the learner must be able to:
7.13 Discuss the principles of the following tests, including Nucleic Acid Testing (NAT), Chemi-luminescence, TPHA and ELISA.
7.14 Discuss special laboratory requirements and precautions

Testing
On completion of this section, the learner must have:
7.15 Observed the setting up of tests for HBV, HCV, HIV and Syphilis

Interpretation and validation of results
On completion of this section, the learner must be able to:
7.16 Interpret and validate the results

Confirmation of repeat reactive tests
On completion of this section, the learner must:
7.17 Explain the need and process for confirmatory tests

SECTION EIGHT
BLOOD PROCESSING

On completion of this section, the learner must:
Be able to describe the product preparation methods, storage temperatures, shelf life and clinical indications for:

Cellular products

- Whole blood
- Red cell concentrates
  Standard red cell (buffy-coat poor)
  Washed red cell
  Frozen red cell
  Paediatric/infant red cell
  Haemoconcentrates
- Platelet concentrates
  Apheresis
  Pooled

Low titre Anti-T platelets
Paediatric platelets

- Irradiated cellular products
- Leuco-depleted cellular products

8.3 Plasma Products
Fresh frozen plasma
Cryo-poor plasma
Paediatric plasma
Low Anti-T titre plasma
Cryoprecipitate

8.4 Fractionated Blood Products
Immune serum globulin
Normal immunoglobulins
Factor VIII
Factor IX concentrates
Stabilized serum
Albumin
Freeze dried plasma

8.5 The importance of Blood Cold Chain Management

8.6 Describe anticoagulants and anticoagulant preservative solutions in common use and the changes which occur in stored blood

SECTION NINE
IMMUNOLOGY

On completion of this section the learner must be able to explain:

- Antigens and antibodies, including allo-antibodies, heterophile antibodies and auto antibodies
- Cellular and humoral response
- Primary and secondary immune response
- Active and passive immunity
- Complement
- Antigen/antibody reactions

SECTION TEN
HAEMATOLOGY

On completion of this section the learner must be able to explain:

- Anatomy and physiology of the circulatory system
- The causes and treatments of shock
- The characteristics and function of the principal constituents of blood
- Abnormal levels of erythrocytes, leucocytes and thrombocytes

- Haemostasis

SECTION ELEVEN
GENETICS

On completion of this section the learner must be able to:

- Define genetic terminology
- Be able to apply the laws of Mendelian inheritance

SECTION TWELVE
BLOOD GROUP SYSTEMS

12.1 ABO BLOOD GROUP SYSTEM

On completion of this section the learner must be able to explain:

- The inheritance of blood group genes and antigenic expression
- Bombay phenotype
- The clinical significance of the antigens and antibodies including subgroups
- Universal donor and recipient
- Secretor status

12.2 Rh BLOOD GROUP SYSTEM

On completion of this section the learner must be able to explain:

- The theories of the inheritance (Fisher-Race, Wiener, present)
- Rh nomenclatures
- The clinical significance of the Rh blood group antigens and antibodies
- D Variants (weak and partial)
- The interpretation of the Rh phenotypes and genotypes

12.3 Other Blood Group Systems

On completion of this section the learner must be able to explain:
The clinical significance and characteristics of the antigens and antibodies of the Kell, Duffy, Kidd, I, P, MNSs, Lutheran and Lewis blood group systems. Knowledge of other blood group systems is a requirement

12.4 Explain discrepancies related to all blood group systems

SECTION THIRTEEN
HAEMOLYTIC DISEASE OF THE FOETUS AND NEWBORN (HDFN)

On completion of this section the learner must be able to explain:

- The pathogenesis of HDFN
- Antenatal and postnatal investigations
- Interpretation and reporting of results

- Treatment options
- Procedures to determine severity of HDFN
- Prophylaxis

SECTION FOURTEEN
PRINCIPLES OF SEROLOGICAL TESTING

On completion of this section the learner must be able to discuss:

- The grading and interpretation of agglutination:
  Range: tests both manual and automated, including but not limited to: tube techniques (saline, enzyme and antiglobulin techniques), microwell, column agglutination technology, gel and magnetic beads, slide techniques
- Techniques for titration and antibody identification
- The causes of false positive and false negative results

SECTION FIFTEEN
COMPATIBILITY TESTING

On completion of this section the learner be able to apply the processes and procedures relating to:

- Various types of crossmatch requests
- Sample receipt
- Importance of patient ABO and Rh typing
- Criteria for selection of blood products
- Interpretation of results
- Causes of incompatible crossmatches
- Labelling and issue of products
- Record keeping

The learner must be able to describe both manual and automated techniques

SECTION SIXTEEN
RISKS ASSOCIATED WITH BLOOD TRANSFUSION

On completion of this section the learner must be able to discuss:

16.1 The causes, characteristics and clinical significance of:

- Acute and delayed haemolytic transfusion reactions
- Febrile non-haemolytic transfusion reactions
- Allergic reactions
- Transfusion of contaminated blood
- Transfusion associated Graft versus host disease (TA-GvHD)
- Transfusion related acute lung injury (TRALI)
- Post Transfusion Purpura (PTP)
- Mechanical reactions
- Metabolic reactions

- Allo-immunization
- Transfusion associated circulatory overload (TACO)
- Complications associated with incorrect procedures of blood warming

16.2 The risks associated with disease transmission
16.3 The importance of having look-back systems
16.4 The haemovigilance programme
16.5 Investigation of transfusion reactions

SECTION SEVENTEEN
PATERNITY TESTING

Rules of Inheritance
On completion of this section, the learner must be able to:
17.1 Explain the two rules of inheritance that are applied to cases of disputed paternity and give examples of each using any blood group system

Red cell typing
On completion of this section, the learner must be able to:
17.2 List and discuss the most common pitfalls encountered in blood grouping within the ABO, Rh, Kell, MNSs, Duffy and Kidd systems, which may affect the interpretation of paternity results

Molecular typing
On completion of this section, the learner must be able to:
17.3 Explain the principle of DNA typing
17.4 Discuss the role of DNA typing in disputed paternities
17.5 Interpret DNA paternity test results
17.6 Discuss the role of HLA typing in paternity testing

SECTION EIGHTEEN
HLA TESTING

Screening sera for antibodies
On completion of this section, the learner must be able to:
18.1 Discuss how the panel of frozen lymphocytes is used to screen sera for lymphocyte antibodies
18.2 Describe the technique and reasons for the panel size

Identification of Antibodies
On completion of this section, the learner must be able to:
18.3 Discuss methods for DNA extraction / preparation
18.4 Explain the principles of PCR
18.5 Describe a method of using DNA for HLA typing
18.6 Draw a pedigree of a hypothetical family with a recombinant gene

HLA Typing
On completion of this section, the learner must:
18.7 Explain the procedure for HLA typing

Transplantation

On completion of this section, the learner must be able to:
18.8 Discuss the role of HLA in tissue transplantation

Diseases and HLA
On completion of this section, the learner must be able to:
18.9 Discuss diseases associated with HLA

SECTION NINETEEN
REAGENT PREPARATION AND STANDARDISATION

Reagent Preparation
On completion of this section the learner must be able to discuss:
19.1 Standardisation of monoclonal antisera
19.2 Selection of red cells for antibody identification

SECTION TWENTY
QUALITY

On completion of this section the learner must be able to:
20.1 Explain the principles of QMS (Quality Management System)
20.2 Define and discuss the terms related to quality
20.3 Compliance to quality protocols must be applied to all procedures

PRACTICAL

1. Health and safety

2. Equipment and materials

4. Donation collection

5. Donation testing

6. Donation processing

7. Compatibility testing

8. Transfusion reaction investigation

9. Antenatal and postnatal testing

When completing the syllabus, students must understand that the practical and theoretical aspects are integrated.

SECTION ONE
SAFETY HEALTH ENVIRONMENT (SHE)

On completion of this section the learner must be able to:

- Classify, handle and dispose of hazardous material
- Decontaminate laboratory equipment
- Manage spillages and breakages
- Demonstrate the correct use of personal protective equipment (PPE)
- Apply safety precautions and procedures

SECTION TWO
LABORATORY EQUIPMENT

On completion of this section the learner must be able to demonstrate:

- The operation, maintenance, calibration and validation procedures for the following equipment:
  - Centrifuges
  - Thermometers
  - Laminar Flow Cabinets
  - Pipettes
  - Waterbaths/dry baths
  - Automated equipment
  - Refrigerators
  - Deep freezers
  - Processing equipment
  - Temperature monitoring equipment
- Troubleshooting processes associated with the above equipment

SECTION THREE
BLOOD COLLECTION

The learner must observe:

- The practical procedures relating to donor selection and blood collection

SECTION FOUR
BLOOD PROCESSING

On completion of this section the learner must have observed or practiced:

- The techniques used in the preparation of cellular and plasma components

SECTION FIVE
DONATION TESTING

Manual Donation Testing

On completion of the section the learner must be able to:

- Manually group blood samples
- Perform tests for sub groups of A and weak D groups
- Screen for irregular antibodies
- Interpret the donation testing results

Automated Donation testing

On completion of this section the learner must be able to explain:

- The basic principles of automated donation testing
- Interpretation of automated donation testing results

Transmissible disease testing

On completion of this section the learner must be able to explain:

- The principles of the tests for transmissible diseases
- The maintenance and operation of automated equipment used in performing the tests
- How to interpret test results

SECTION SIX
COMPATIBILITY TESTING

On completion of this section the learner must be able to:

- Receive and register samples
- Perform group and screen tests
- Perform compatibility tests
- Perform problem compatibility tests
- Interpret and report on results
- Issue blood products

SECTION SEVEN
TRANSFUSION REACTION INVESTIGATION

On completion of this section the learner must be able to:

- Inform medical staff of transfusion reaction protocols:
  Request samples and documents from the medical staff
- Perform investigation:
  Clerical checks
  Visual checks
  Tests to identify the possible causes of the transfusion reaction

SECTION EIGHT
ANTENATAL AND POSTNATAL TESTING

On completion of this section the learner must be able to:

- Perform routine antenatal and postnatal tests
- Apply different techniques for antibody identification and titration tests
- Interpret results and compile a report

SECTION NINE
QUALITY

Compliance to quality protocols must be applied to all procedures

RECOMMENDED REFERENCE BOOKS

1. Standards for Practice of Blood Transfusion in South Africa
2. Clinical Guidelines for the Use of Blood Products in South Africa
3. Applied Blood Group Serology – P. Issit
4. AABB Technical Manual
5. Modern Blood Banking and Transfusion Practices - D.M. Harmening
6. Human Blood Groups - Geoff Daniels
7. Immunohaematology - Eva Quinley
8. Mollison's Blood Transfusion in Clinical Medicine – Harvey Klein & D. Anstee
9. ISBT series Volume 3 - Beryl Armstrong
10. Practical Transfusion Medicine – Murphy Pamphilon

THE LATEST EDITION OF EACH REFERENCE BOOK SHOULD BE USED.