NOS.BS.01
FIRST EDITION

NATIONAL OCCUPATIONAL STANDARD FOR BIOMEDICAL SCIENTIST

ZAMBIA QUALIFICATIONS AUTHORITY

APPROVING AUTHORITY

This National Occupational Standard has been prepared and published under the authority of the Zambia Qualifications Authority Board on [insert date when NOS was approved by the ZAQA Board].

ZAMBIA QUALIFICATIONS AUTHORITY

The Zambia Qualifications Authority Act No. 13 of 2011 was enacted by the Government of the Republic of Zambia to ***"provide for the development and implementation of a national qualifications framework; establish the Zambia Qualifications Authority; provide for the registration and accreditation of qualifications; provide measures to ensure that standards and registered qualifications are internationally comparable; and provide for matters connected with, or incidental to the foregoing".*** Among other functions, ZAQA is responsible for ***determining national standards for any occupation***, through various sector specific National Occupational Standards Development Teams (NOSDTs).

REVISION OF NATIONAL OCCUPATIONAL STANDARDS

National Occupational Standards (NOS) shall be revised every after **5 years**, or whenever necessary, by the issue of either amendments or of revised editions. It is important that users of NOS ascertain that they are in possession of the latest amendments or editions.

NOS DEVELOPMENT TEAM RESPONSIBLE

This National Occupational Standard was prepared by the Manufacturing National Occupational Standards Development Team, upon which the following organisations were represented:

1. Biomedical Society of Zambia (BMSZ)
2. Copperbelt University (CBU)
3. Engineering Institution of Zambia (EIZ)
4. Good Time Steel Company Zambia Limited (GTS)
5. Lusaka Vocational and Technical College (LVTC)
6. Makeni Ecumenical Centre (MEC)
7. Ministry of Commerce, Trade and Industry (MCTI)
8. Ministry of Health (MoH)
9. National Institute for Scientific and Industrial Research (NISIR)
10. Northern Technical College (NORTEC)
11. University of Lusaka (UNILUS)
12. University of Zambia (UNZA)
13. Zambia Association of Manufacturers (ZAM)
14. Zambia Forestry College (ZFC)
15. Zambia Qualifications Authority (ZAQA)– Secretariat

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FOREWORD

The Zambia Qualifications Authority (ZAQA) is a statutory body under the Ministry of Education established by ZAQA Act No. 13 of 2011 to "***develop and implement a national qualifications framework; register and accredit qualifications; and ensure that standards and registered qualifications are internationally comparable****".*

Among other functions, ZAQA is responsible for ***"determining national standards for any occupation"***, through various sector specific National Occupational Standards Development Teams (NOSDTs) of experts composed of representation from appropriate authorities, government departments, industry, academia, regulators, consumer associations and non-governmental organisations, etc.

This National Occupational Standard (NOS) has been developed by the Manufacturing National Occupational Standards Development Team in accordance with the procedures and guidelines of ZAQA. All users should ensure that they have the latest edition of this publication as NOS are revised from time to time.

This NOS shall be used by, among others, industry, employers, quality assurance bodies, awarding and professional bodies and education and training institutions, as a benchmark to identify training needs, develop job profiles/descriptions, develop curricula and learning programmes, in various sectors where the occupation exists. In the Manufacturing sector, demonstration of competence against this NOS may be required in order to run a business or practice a craft or profession.

JUSTIFICATION

Over the last 20 to 30 years, Medicine and Health practice has become complex due to the emergency of new diseases and technologies used to diagnose them. Biomedical sciences have evolved to provide specialised new methods and technologies of detecting and monitoring the new health threats such as Covid-19 while also improving the detection and monitoring of old diseases such as Malaria. As such, a Biomedical Scientist is central and cardinal in healthcare provision by performing laboratory in-vitro diagnostic tests through the application of skills and knowledge in core competences of Haematology and Blood Transfusion science, Medical Microbiology, Clinical Chemistry, Medical Parasitology, Histopathology, Virology, and Molecular Biology.

Overall, the work of Biomedical Scientists is an important linkage between clinical care, nursing and therapy. A Biomedical Scientist supports the work of other healthcare professionals such as medical doctors, nurses, pharmacists and health policymakers through medical research.

This National Occupational Standard highlights core knowledge, skills, competences and personal attributes that Biomedical Scientists must possess to be successful in their jobs.

ACRONYMS AND ABBREVIATIONS

BS	Biomedical Scientist
CS	Core Skill
DNOS	Draft National Occupational Standard
FEFO	First Expire, First Out
LIMS	Laboratory Information Management System
NOS	National Occupational Standard
NOSDT	National Occupational Standards Development Team
OK	Organisational Knowledge
PC	Performance Criteria
PS	Professional Skill
RK	Regulatory Knowledge
RPL	Recognition of Prior Learning
TK	Technical Knowledge
ZAMMSA	Zambia Medicines and Medical Supplies Agency
ZAQA	Zambia Qualifications Authority
ZQF	Zambia Qualifications Framework

GLOSSARY OF TERMS

For the purposes of this NOS, the following terms and definitions shall apply:

Core Skills/Generic Skills: A group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the NOS, these include communication related skills that are applicable to most job roles.

Function: An activity necessary for achieving the key purpose of the sector, occupation, or area of work, which can be carried out by a person or a group of persons. Functions are identified through functional analysis and form the basis of NOS.

Job Title: A unique set of functions that together form a unique employment opportunity in an organisation.

Knowledge and Understanding: Statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.

National Occupational Standards (NOS): Statements of the standards of performance individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding. They are precise descriptions of what an individual is expected to be able to do in his/her work role.

NOS Code: A unique reference code that identifies a NOS.

National Occupational Standards Development Team (NOSDT): An established group of national stakeholders/experts responsible for the development of National Occupational Standards within a specific economic sector or occupation.

Occupation: A set of job roles, which perform similar/related set of functions in an industry.

Organisational Context: The manner in which the organisation is structured and how it operates, including the extent of operative knowledge that managers have in their relevant areas of responsibility.

Performance Criteria: Statements that together specify the standard of performance required when carrying out a task.

Scope: A set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on the quality of performance required.

Sector: A conglomeration of different business operations having similar businesses and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.

Sub Sector: A further breakdown of the sector based on the characteristics and interests of its components.

Technical Knowledge: the specific knowledge needed to accomplish specific designated responsibilities.

Unit Title: An overall statement about what the incumbent should be able to do.

1. OVERVIEW

This is an introductory section providing a brief summary and specific information or commentary about the content of the NOS and the targeted sector and occupation to help the user judge whether it is relevant to them.

NOS Code	NOS.BS.01
Occupation	Biomedical Sciences
Job Title	Biomedical Scientist
Job Description	A Biomedical Scientist is critical in the provision of primary and secondary health care services. He/she is responsible for the supervision of subordinates, coordination of laboratory work, validation of test methods and results, monitoring and training of staff and students on new methods and procedures, evaluation of quality assurance process and safety in the medical laboratory and conducting medical research to contribute to advancement in medical technology.
Job Purpose	Biomedical Scientists work to perform a wide range of medical diagnostic tests, conduct and publish biomedical research findings and offer teaching and training in learning institutions.
ZQF Level	7
Sector	Manufacturing
Sub sectors	Health, Education, Regulatory bodies e.g. ZAMMSA, HPCZ, ZAMRA, NHIMA,
Other Economic Sector(s) in which the Occupation is Practiced	Water and sanitation, government ministries and agencies, Food and Drug, Mining (Health & Safety) etc.
Other Similar Jobs that can be performed by the Biomedical Scientist	Tutor/Lecturer/Trainer/Researcher, Biomedical Sales Manager, Consultant, Assistant director- Laboratory services (MoH),etc.
Minimum Educational Job Entry Qualification	Bachelor's Degree in Biomedical Sciences
Practicing License Requirements (if any)	Membership with the Health Professions Council of Zambia (HPCZ)
Training/RPL	1. A – levels: Entry year 2 of training 2. Diploma in Biomedical sciences: Entry year 3 of training 3. Any Health Related Degree: Entry year 2 of training 4. Use of ICT
Minimum Job Entry Age	20 years
Prior Experience (Suggested)	Minimum of 1 year internship
Performance Criteria	As described in the Units under Section 4

2. SCOPE

This NOS specifies the fundamental knowledge and understanding, skills and competences that Biomedical Scientists must possess to be successful in their jobs.

3. PERSONAL ATTRIBUTES (VALUES, ETHICS AND ATTITUDES)

The Biomedical Scientist should possess the following attributes:

- Sound research skills
- Attention to detail
- Problem solving skills
- Analytical skills
- High level of professional and ethical practice standards
- Strong interpersonal skills
- Be polite, considerate, trustworthy and honest
- Act with integrity, maintain confidentiality, respect patients' dignity and privacy.

4. UNITS AND ELEMENTS

This NOS is divided into **8 units** representing the tasks that a jobholder should undertake in his/her day to day work. The unit is further broken down into elements depicting the number of activities to be carried out for the successful execution of a particular task

UNIT 1 [This Unit covers the skills and knowledge by a Biomedical Scientist in demonstrating laboratory safety and waste management].

Unit No.	**01**
Unit Title	**Medical Laboratory Safety and Waste Management**
Description	This Unit describes the skills and knowledge required by a Biomedical Scientist to safely work and dispose of waste materials in the medical laboratory
Scope	This Unit covers the following: • Use of Personal protective equipment (PPE) and First Aid box • Awareness of the types of hazards • Types of medical laboratory wastes • Safe waste disposal • Disinfection, decontamination and incineration
Performance Criteria (PC) with respect to the Scope	
Element	**Performance Criteria (PC)**
Use of Personal protective equipment (PPE) and first aid box	To be competent, the individual must be able to: PC1. Use PPE appropriately - Wear gloves, lab coats, Pressurised suits, safety googles - Wear appropriate closed shoes - Tie long hair PC2. Use the First Aid Box
Awareness of the types of hazards	To be competent, the individual must be able to: PC3. Identify types of hazards in the laboratory - Fire hazards - Bio-hazards - Chemical hazards - Electrical hazards
Types of medical laboratory wastes	To be competent, the individual must be able to: PC4. Recognise types of laboratory waste - Biological waste - Non biological waste - Sharp waste
Safe waste disposal and	To be competent, the individual must be able to: PC5. Dispose laboratory waste safely PC6. Dispose waste according to laboratory safety manual
Disinfection, decontamination and incineration	To be competent, the individual must be able to: PC7. Disinfect work surfaces in the Laboratory before beginning work according to Laboratory safety manual PC8. Autoclave reusable laboratory instruments PC9. Autoclave infectious biological wastes and incinerate sharps
Knowledge and Understanding (K)	
A. Organisational Context (Knowledge of the laboratory safety manual and its guidelines)	The individual on the job must demonstrate knowledge and understanding of: OK1. Laboratory safety manual procedures. OK2. Good Laboratory Practice Manual OK3. Standard Operating Procedures

B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: TK1. Risk assessment TK2. Disposal of the PPEs TK3. Contents and Use of the First Aid box TK4. Different colour codes of bin liners for waste disposal TK5. Types of biological and non-biological wastes TK6. Use and preparation of disinfectants according to the SOP TK7. Use and operation of the different types of safety cabinets TK8. Operations of an Autoclave
C. Regulatory Knowledge (Knowledge of rules and regulation)	The individual on the job must demonstrate knowledge and understanding of: RK1. Relevant Occupational Health and Safety Laws RK2. Relevant Zambia National Biomedical Laboratory Safety Manual RK3. Relevant World Health Organisation Laboratory Safety Manual RK4. Zambia Environmental Management Agency, (Act 2011)
Skills (S)	
A.Core Skills/ Generic Skills	**Writing Skills**
	The individual on the job must be able to: CS1. Write in the English language proficiently and/or have the means to write complex instructions in reports and SOPs CS2. Prepare and provide clear and detailed instructions, details of pathways and sketches to co-workers
	Reading Skills
	The individual on the job must be able to: CS3. Read the English language proficiently and be able to or have the means to give detailed instructions. CS4. Read and interpret complex sketches, operating manual drawings or instructions provided for the required work
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS5. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS6. Convey information clearly, concisely and proficiently to co-workers
B.Professional Skills	**Decision Making**
	The individual on the job must be able to: PS1. Decide whether the laboratory is safe for working and ensure That a particular task is not creating hazardous conditions for other workers PS2. Decide whether the equipment setup is safe for the intended work flow

	Plan and Organise
	The individual on the job should be able to: PS3.Decide if the laboratory working space is sufficient for its intended use PS4. Appoint a laboratory safety officer to be enforcing health standards according to the safety manual PS5. Develop working Rotas and work allocation PS6. Allocate sufficient resources for procuring safety equipment and maintenance of safety in the laboratory.
	Customer Centricity
	The individual on the job should be able to: PS7. Manage relationships with patients and other clients by ensuring professionalism and confidentiality
	Problem-Solving
	The individual on the job should be able to: PS8. Resolve any conflicts with the subordinates and colleagues professionally and where necessary, refer to HR department
	Analytical Thinking
	The individual on the job should be able to: PS9. Analyse and categorise potentially different safety challenges within the laboratory
	Critical Thinking
	The individual on the job should be able to: PS10. Identify the common safety lapses and the types of accidents that occur in the laboratory

UNIT 2 [This Unit covers the skills and knowledge by a Biomedical scientist in demonstrating practical Medical Laboratory skills to perform diagnostic procedures]

Unit No.	**02**
Unit Title	**Practical Medical Laboratory skills to perform diagnostic procedures**
Description	This Unit describes the skills and knowledge required by a Biomedical Scientist to carry out Laboratory diagnostic procedures in Haematology & Blood Transfusion Science, Clinical Chemistry, Medical Microbiology, Medical Parasitology, Medical Virology and Molecular Biology, Phlebotomy and specimen collection, Histopathology and Immunology Departments in the Medical Laboratory.
Scope	This Unit covers the following: • Application of practical skills when performing diagnostic procedures. • Detailed analytical skills to produce accurate and reliable results • Attention to detail when performing diagnostic procedures • Analyse and interpret data produced after conducting the diagnostic procedure • Conduct quality assurance tests before using the equipment for diagnostic procedures
Performance Criteria (PC) with respect to the Scope	
Element	**Performance Criteria (PC)**
Application of practical skills when performing diagnostic procedures.	To be competent, the individual must be able to: PC1. Apply Medical Laboratory skills PC2. Demonstrate practical skills developed during training PC3. Perform diagnostic procedures according to SOPs
Detailed analytical skills to produce accurate and reliable results	To be competent, the individual must be able to: PC4. Analyse information related to the specific procedure PC5. Identify additional requirement for the specific procedures PC6. Apply problem-solving skills PC7. Think through the task critically PC8. Brainstorm with other scientists to arrive at accurate results
Attention to detail when performing diagnostic procedures	To be competent, the individual must be able to: PC9. Perform laboratory diagnostic Procedures according to SOPs PC10. Organise workspace, reagents and equipment before commencing the laboratory diagnostic procedure. PC11. Carry out the laboratory diagnostic techniques accurately PC12. Conduct the laboratory diagnostic techniques according to routine procedure PC13. Concentrate throughout the process of the procedure
Analyse and interpret data produced after conducting the diagnostic procedure	To be competent, the individual must be able to: PC14. Analyse each component of the data to arrive at the accurate Laboratory Diagnosis PC15. Explain Scientifically what the findings of the procedure mean PC16. Present, select, organise and group ideas and evidence in a logical way on the Laboratory request form

Conduct quality assurance tests before using the equipment for diagnostic procedures	To be competent, the individual must be able to: PC17. Conduct quality assurance (QA) tests on equipment before testing patients' samples. PC18. Schedule service time for all equipment in the Medical Laboratory to maintain accurate performance of the equipment PC19. Ensure that the Quality assurance Officer enforce quality assurance management issues in the Medical Laboratory
Knowledge and Understanding (K)	
A. Organisation-al Context (Knowledge of the Standard Operating Procedures and its guidelines)	The individual on the job must demonstrate knowledge and understanding of: OK 1. Standard Operating Procedures (SOPs) OK 2. Good Laboratory Practice Manual OK 3. Laboratory Safety Manual
B. Technical Knowledge	The individual on the job must demonstrate Technical knowledge and understanding of:: TK1. Laboratory skills in Haematology and Blood Transfusion Science – Staining of blood slides, Blood typing and cross match TK2. Laboratory skills in Medical Microbiology – Microscopy, culture and sensitivity testing skills and aseptic technique skills TK3. Laboratory skills in Medical Parasitology – Preparation of thin and thick smears and wet preparation of slides for microscopy TK4. Laboratory skills in Virology and Molecular Biology – PCR technique TK5. Laboratory skills in Histopathology – Tissue processing and staining TK6. Laboratory skills in Immunology – Serology TK7. Laboratory skills in phlebotomy using the syringe or Vacutainer methods
C. Regulatory Knowledge (Knowledge of rules and regulations)	The individual on the job must demonstrate knowledge and understanding of: RK1. Relevant Occupational Health and Safety Laws RK2. Zambia National Biomedical Laboratory Safety Manual RK3. Relevant World Health Organisation Laboratory Safety Manuals RK4. The relevant Health Professional Acts and regulations
Skills (S)	
A. Core Skills/ Generic Skills	**Writing Skills** The individual on the job must be able to: CS1. Write in the English language proficiently and/or have the means to write complex instructions in reports and SOPs CS2. Prepare and provide clear and detailed instructions, details of pathways and sketches to co-workers

	Reading Skills
	The individual on the job must be able to: CS3. Read the English language proficiently and be able to or have the means to give detailed instructions CS4. Read and interpret complex sketches, operating manual drawings or instructions provided for the required work
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS5. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS6. Convey information clearly and concisely to co-workers
B. Professional Skills	**Decision Making**
	The individual on the job must be able to: PS1. Decide whether the equipment used for the specific diagnostic procedure is operating normally to produce accurate and reliable results. PS2. Decide whether the results produced can be well interpreted to help in the further management of the patient by the Medical staff.
	Plan and Organise
	The individual on the job should be able to: PS3.Decide if the laboratory working space is sufficient for its intended use PS4. Ensure that Quality Assurance Officer enforce health standards regarding Laboratory equipment and their performance. PS5. Allocate sufficient resources for procuring Laboratory reagents and consumables required to conduct diagnostic procedures.
	Customer Centricity
	The individual on the job should be able to: PS6. Manage relationships with patients and other clients by ensuring that confidentiality is maintained
	Problem Solving
	The individual on the job should be able to: PS7. Ensure that all Laboratory equipment is operating normally and that Laboratory reagents and consumables are available to conduct Laboratory Diagnostic Procedures. PS8. Report to the senior management if the equipment is not working normally so that arrangements for repair or ordering for the new equipment are included in the plan.
	Analytical Thinking
	The individual on the job should be able to: PS9. Analyse and categorise potentially different challenges within the Laboratory affecting the performance of diagnostic procedures.
	Critical Thinking
	The individual on the job should be able to: PS10. Identify the common challenges with diagnostic equipment and Laboratory reagents and consumables shortages in the Medical Laboratory.

UNIT 03 [This Unit covers the skills and knowledge by a Biomedical Scientist in Logistic and Supply Chain Management].

Unit No.	**03**
Unit Title	**Logistic and Supply Chain Management**
Description	This Unit describes the skills and knowledge required by a biomedical scientist to use in logistic and supply chain management of HIV test kits and Laboratory commodities
Scope	This Unit covers the following: • Use of standard operating procedures manual for management of the National HIV test logistics system • Use of standard operating procedures manual for management of the national laboratory commodity logistics system
Performance Criteria (PC) with respect to the Scope	
Element	**Performance Criteria (PC)**
Use of standard operating procedures manual for management of the national HIV test logistics system	To be competent, the individual must be able to: PC1. Identify his/her roles and responsibilities in the national HIV test logistics system PC2. Identify the forms used in managing HIV test logistics system PC3. Employ the Job Aid in the standard operating procedures manual to perform tasks PC4. Operate the electronic Laboratory Information Management System (eLIMS) central edition or facility edition to place orders from ZAMMSA
Use of standard operating procedures manual for management of the national laboratory commodity logistics system	To be competent, the individual must be able to: PC5. Identify his/her roles and responsibilities in the standard operating Procedures manual For Management of the national Laboratory commodity Logistics system PC6. Identify the forms used in managing HIV test logistics system PC7. Employ the Job Aid in the standard operating procedures manual to perform tasks PC8. Operate the eLIMS central edition and facility edition to place orders ZAMMSA
Knowledge and Understanding (K)	
A. Organisation-al Context (Knowledge of the standard operating procedures manual for management of the national laboratory commodity logistics system and HIV logistic system)	The individual on the job must demonstrate knowledge and understanding of: OK1. Use of each form in the HIV test kits and the National Laboratory Commodity Logistics System OK2. Use of the eLIMS

B. Technical Knowledge (The national HIV test logistics system and National laboratory commodity logistics System)	The individual on the job must demonstrate knowledge and understanding of: TK1.The roles and responsibilities of the biomedical scientist in the supply chain management of the HIV test kit system TK2.Recording the usage of HIV test kits TK3.Assessing stock status TK4.Reporting and Ordering HIV test kits TK5.Receiving HIV test Kits TK6.Storing of HIV test Kits TK7.National laboratory commodity logistics System TK8.Recording the usage of the Laboratory commodities TK9.Assessing stock status TK10.Reporting the usage of the laboratory commodities TK11.Receiving Laboratory commodities TK12.Storage of laboratory commodities
C. Regulatory Knowledge (Knowledge of rules and regulation)	The individual on the job must demonstrate knowledge and understanding of: RK1. Standard operating procedures manual for management of the National Laboratory Commodity Logistics System RK2. Standard operating procedures manual for management of the National HIV Test Logistics System RK3. Guidelines for managing the Laboratory Supply Chain (v.2), USAID |DELIVER PROJECT
Skills (S)	
A. Core Skills/ Generic Skills	**Writing Skills**
	The individual on the job must be able to: CS1. Write in the English Language proficiently and/or have the means to write complex instructions in reports and SOPs CS2. Prepare and provide clear and detailed instructions, details of pathways and sketches to co-workers
	Reading Skills
	The individual on the job must be able to: CS3. Read English proficiently and/or have the means to give instructions proficiently in the local language used at the site CS4. Read and interpret LIMS document or instructions provided for the required work
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS5. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS6. Convey information clearly and concisely to co-workers
B. Professional Skills	**Decision Making**
	The individual on the job must be able to: PS1. Decide which job aid to use when he/she wants to perform an action from the standard operating procedures manual for the Management of the National Laboratory Commodity Logistics System and standard operating procedures manual for Management of the National HIV Test Logistics System PS2. Regularly access stock status for each commodity in the supply chain system for decision making

	Plan and Organise
	The individual on the job should be able to: PS3. Decide and ensure availability of the supply chain management system PS4. Use the facility edition or central edition of the eLIMS
	Customer Centricity
	The individual on the job should be able to: PS5. Manage the logistic and supply chain management system for continuous service delivery
	Problem Solving
	The individual on the job should be able to: PS6. Resolve challenges in the operations of logistic and supply chain management within the laboratory PS7. Contact supervisors if the challenges in the logistic and supply chain management system cannot be resolved
	Analytical Thinking
	The individual on the job should be able to: PS8. Analyse challenges of the logistics and supply chain management system
	Critical Thinking
	The individual on the job should be able to: PS9. Employ corrective measures to address challenges in the logistic and supply chain management System

UNIT 04 [This Unit covers the skills and knowledge by a Biomedical scientist in Main Laboratory Stores Management].

Unit No.	**04**
Unit Title	**Laboratory Store Room Management**
Description	This Unit describes the skills and knowledge required by a Biomedical Scientist in Main Laboratory Stores Management
Scope	This Unit covers the following: • Securing Laboratory storeroom • Storage of laboratory commodities • Laboratory Inventory Management
Performance Criteria (PC) with respect to the Scope	
Element	**Performance Criteria (PC)**
Securing Laboratory storeroom	To be competent, the individual must be able to: PC1. Ensure and check that the store room is strongly built with a secure door
Storage of laboratory commodities	To be competent, the individual must be able to: PC2. Check and identify the reagents, consumables, and durables PC3. Stack the reagents in a particular section, the consumables in their section and the durables in their section PC4. Identify laboratory commodities with special storage requirements and store them according to their requirement PC5. Identify and store laboratory commodities according to the principle of First Expire, First Out (FEFO) PC5. Approve that the laboratory commodities are physically inspected
Laboratory Inventory Management	To be competent, the individual must be able to: PC6. Put each stock control card next to the specific laboratory commodity PC7. Record every transaction on the laboratory stock control after every issuing or receiving stock PC8. Report any theft or loss of stock of any laboratory commodity
Knowledge and Understanding (K)	
A. Organisation-al Context (Knowledge of the standard operating procedures commodity logistics system)	The individual on the job must demonstrate knowledge and understanding of: OK1. Use of each LIMS document in the HIV test kit and the national laboratory commodity logistics System OK2. Conducting the physical count every month end
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of:: TK1. A wide variety of storage requirements for different commodities for their maintenance TK2. Different reagents, consumables and durables

	TK3. Physical condition of each commodity TK4. Principle of FEFO
C. Regulatory Knowledge (Knowledge of rules and regulation)	The individual on the job must demonstrate knowledge and understanding of: RK1. Guidelines for managing the laboratory supply chain (v.2), July, 2008 RK2. Standard operating procedures manual For Management of the national Laboratory commodity Logistics system RK3. Standard operating procedures manual For Management of the national HIV test logistics system
Skills (S)	
A. Core Skills/ Generic Skills	**Writing Skills**
	The individual on the job must be able to: CS1. Write in the English language proficiently and/or have the means to write complex instructions in reports and SOPs CS2. Prepare and provide clear and detailed instructions, details of pathways and sketches to co-workers
	Reading Skills
	The individual on the job must be able to: CS3. Read English proficiently and be able to or have the means to give detailed instructions CS4. Read and interpret LIMS document or instructions provided for the required work
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS5. Listen attentively and interpret communication/instruction from the supervisor and other co-workers CS6. Convey information clearly, concisely and proficiently to co-workers
B. Professional Skills	**Decision Making**
	The individual on the job must be able to: PS1. Decide the layout of the storeroom for maximum use of storage space PS2. Regularly conduct physical inspection on the state of the store room and stock status for each commodity for decision-making
	Plan and Organise
	The individual on the job should be able to: PS3.Decide where consumables, reagents and durables are stored in the storeroom for safety PS4. Decide the storage of flammable, corrosives, commodities requiring cold storage
	Customer Centricity
	The individual on the job should be able to: PS5. Manage the store room and ensure availability of commodities for the benefits of the patients
	Problem Solving

	The individual on the job should be able to: PS6. Resolve challenges in the store room related to receiving and issuing of commodities PS7. Request for more space for Management for better storage of commodities PS8. Appoint a dedicated stores manager
	Analytical Thinking
	The individual on the job should be able to: PS8. Analyse challenges associated with poor storage conditions of commodities
	Critical Thinking
	The individual on the job should be able to: PS9. Employ corrective measures to address challenges with shortages of laboratory commodities.

UNIT 5 [This Unit covers the skills and knowledge by a Biomedical scientist in demonstrating knowledge on conducting Medical Research and Publications.

Unit No.	**05**
Unit Title	**Medical Research and Publications**
Description	This Unit describes the skills and knowledge required by a Biomedical Scientist to carry out Medical research and publications.
Scope	This Unit covers the following: • Creativity • Data collection and analysis • Academic writing and organization • Time management • Research budget estimation • Publication of research findings
	Performance Criteria (PC)
Creativity	To be competent, the individual must be able to: PC1. Develop or recognize new ideas in Biomedical Sciences PC2. Think flexibly and view scientific issues in a different perspective. PC3. Use imagination or original ideas to create something new and useful in problem solving. PC4. Develop a proposal to communicate the new ideas and look for financial support.
Data collection and analysis	To be competent, the individual must be able to: PC5. Perform experiments in the Laboratory PC6. Develop survey questionnaires to collect data from the study participants PC7. Conduct data sorting and cleaning PC8. Analyse data either qualitatively or quantitatively or both by using the appropriate software packages
Academic writing and organization	To be competent, the individual must be able to: PC9. Use scientific writing skills and communicate information gathered clearly and concisely PC10. Demonstrate how to convey arguments in a logical and convincing manner PC11. Use accurate information which is clear and relevant to the research topic
Time management	To be competent, the individual must be able to: PC12. Use time efficiently and keep track of research deadlines to conduct the research in the stipulated time.
Research budget estimation	To be competent, the individual must be able to: PC13. Estimate the cost of all the materials and logistics that will be required to conduct the research successfully in the stipulated time. PC14. Plan a budget that reveals whether the costs of a proposed research are reasonable.

Publication of research findings	To be competent, the individual must be able to: PC15. Identify a suitable publisher with thematic areas of interest with good research impact factor PC16. Asses the cost of publishing that article taking in article Publishing Cost (APC) PC17. Submit the article as per journal instructions
Knowledge and Understanding (K)	
A. Organisation-al Context (Knowledge of the Standard Procedures guiding research)	The individual on the job must demonstrate knowledge and understanding of: OK 1. National and University Research Ethics committees OK 2. Confidentiality of the participants in the research OK 3. Publishing research findings to add to the body of knowledge and inform policy makers
B. Technical Knowledge	The individual on the job must demonstrate Technical knowledge and understanding of: TK1. Computer software especially word, power point, excel and use of other statistical packages
C. Regulatory Knowledge (Knowledge of rules and regulation)	The individual on the job must demonstrate knowledge and understanding of: RK1. Relevant Zambia National Health Research Authority (NHRA) laws and regulations RK2. Relevant Health Research Acts
Skills (S)	
A. Core Skills/ Generic Skills	**Writing Skills**
	The individual on the job must be able to: CS1. Write in the English language proficiently and/or have the means to write complex instructions in reports and SOPs CS2. Prepare and provide clear and detailed instructions, details of pathways and sketches to co-workers
	Reading Skills
	The individual on the job must be able to: CS3. Read English proficiently and/or have the means to give detailed instructions CS4. Read and interpret complex sketches, operating manual drawings or instructions provided for the required work
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS5. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS6. Convey information clearly and concisely to co-workers

B. Professional Skills	**Decision Making**
	The individual on the job must be able to: PS1. Decide whether the research will contribute significantly to society by informing policymakers of the research findings.
	Plan and Organise
	The individual on the job should be able to: PS2. Decide how the research will be carried out and organise how the findings will be communicated to the stakeholders.
	Customer Centricity
	The individual on the job should be able to: PS3. Manage relationships with the participants in the research and other clients by ensuring that confidentiality is maintained
	Problem-Solving
	The individual on the job should be able to: PS 4. Ensure that all the equipment and logistics needed to conduct the research are available before beginning the research.
	Analytical Thinking
	The individual on the job should be able to: PS5. Analyse and categorise the challenges that affected the process of carrying out the research.
	Critical Thinking
	The individual on the job should be able to: PS6. Identify the challenges encountered when conducting the research and offer recommendations on how to overcome such challenges in the future.

UNIT 6 [This Unit describes the skills and knowledge required by a Biomedical Scientist to play a role in the development and manufacturing of new Laboratory equipment, test kits, drugs and reagents].

Unit No.	**06**
Unit Title	**Manufacturing of Laboratory equipment, test kits, drugs and reagents**
Description	This Unit describes the skills and knowledge required by a Biomedical Scientist to play a role in the development and manufacturing of new Laboratory equipment, test kits, drugs and reagents.
Scope	This Unit covers the following: • Advances in technology and medicine for improving healthcare
	Performance Criteria (PC)
Advances in technology and medicine for improving health care	To be competent, the individual must be able to: PC1. Play a role in developing or recognizing new ideas in Biomedical Sciences that lead to advanced medical technology PC2. Think flexibly and view current medical technology in a different perspective PC3. Use imagination or original ideas to contribute to the development of new technology in Biomedical Sciences and Medicine in general PC4. Collaborate with other experts including Engineers, Information and technology experts, Mathematicians, Biologists and Chemistry experts in developing new medical technology
Knowledge and Understanding (K)	
A.Organisational Context (Knowledge of the Standard Procedures guiding research)	The individual on the job must demonstrate knowledge and understanding of: OK 1. Organisational policies, Global manufacturing regulations of medical equipment, test kits, drugs and reagents and best practices OK 2. Occupation Health, Safety and environmental rules, regulations and guidelines of an Organisation
B.Technical Knowledge	The individual on the job must demonstrate Technical knowledge and understanding of: TK 1. Engineering principles to contribute to the design of new medical equipment, test kits, reagents and drugs. TK 2. Work with other Scientists to research how engineering principles apply to biological systems TK 3. Suggest technical alterations to the medical device, test kit, drug or reagents under development during the manufacturing process with other experts

C.Regulatory Knowledge (Knowledge of rules and regulation)	The individual on the job must demonstrate knowledge and understanding of: RK1. Relevant Zambia National Health Research Authority (NHRA) Laws RK2. Relevant Health Research Laws and regulations RK3. International and National related laws, regulations and standards regarding new technology in Medicine
Skills (S)	
A. Core Skills/ Generic Skills	**Writing Skills**
	The individual on the job must be able to: CS1. Write in the English language proficiently and/or have the means to write complex instructions in reports and SOPs CS2. Prepare and provide clear and detailed instructions, details of pathways and sketches to co-workers
	Reading Skills
	The individual on the job must be able to: CS3. Read English proficiently and/or have the means to give detailed instructions CS4. Read and interpret complex sketches, operating manual drawings or instructions provided for the required work
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS5. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS6. Convey information clearly and concisely to co-workers
B.Professional Skills	**Decision Making**
	The individual on the job must be able to: PS1. Decide whether the Medical device, test kit, drug or reagents developed will contribute significantly to the society by informing policy makers.
	Plan and Organise
	The individual on the job should be able to: PS2. Collaborate with other experts on how the medical device, test kit, drug or reagents will be developed and manufactured and communicate such information to the stake orders.
	Customer Centricity
	The individual on the job should be able to: PS3. Follow code of conduct relating to the development of new medical devices, test kits, drugs and reagents. PS4. Demonstrate that new medical technology will only be used on people when all safety tests have been satisfied.
	Problem Solving
	The individual on the job should be able to: PS6. Ensure that all the other experts required to develop the new equipment, test kit, drug or reagents are available before beginning the work.

	Analytical Thinking
	The individual on the job should be able to: PS7. Analyse and categorise the challenges that affected the process of developing and manufacturing the new medical equipment, test kit, drug and reagents.
	Critical Thinking
	The individual on the job should be able to: PS8. Identify the challenges encountered when contributing to the advancement of Medical Technology and offer recommendations on how to overcome such challenges in the future.

UNIT 7 [This Unit describes the skills and knowledge required by a Biomedical Scientist to identify areas of entrepreneurship in Biomedical Sciences.].

Unit No.	**07**
Unit Title	**Entrepreneurship opportunities in Biomedical Sciences**
Description	This Unit describes the skills and knowledge required by a Biomedical Scientist to identify areas of entrepreneurship in Biomedical Sciences.
Scope	This Unit covers the following: • Business opportunities in the manufacturing and sale of Laboratory equipment, reagents and commodities, setting up private Laboratory practices and training of new scientists in Universities and Colleges.
	Performance Criteria (PC)
Business opportunities in the manufacturing and sale of Laboratory equipment, reagents and commodities, setting up private Laboratory practice and training of new scientists in Universities and Colleges.	To be competent, the individual must be able to: PC1. To identify and explore a wide range of business opportunities available in the field of Biomedical Sciences. PC2. Develop, organize and run a new business. PC3. Act on the business idea to disrupt the current market with a new product or service. PC4. Assess the market and demand for the product or service and the financial risk associated with the business planned.
Knowledge and Understanding (K)	
A.Organisation-al Context (Knowledge of the Standard Procedures guiding business set up in Zambia)	The individual on the job must demonstrate knowledge and understanding of: OK 1. Relevant National standards, policies and procedures followed in the registration of the business company. OK 2. Business company roles, responsibilities, accountabilities, and authorities
B.Technical Knowledge	The individual on the job must demonstrate Technical knowledge and understanding of: TK1. Creating a business plan TK2. Acquiring resources and financing for the new business TK3. Hiring suitable labor for the business TK4. Providing leadership and management for the business
C.Regulatory Knowledge (Knowledge of rules and regulation)	The individual on the job must demonstrate knowledge and understanding of: RK1. Patents and Companies Registration Agency (PACRA) RK2. Zambia Revenue Authority (ZRA) RK3. Zambia Development Agency (ZDA) RK4. Competition and Consumer Protection Commission (CCPC)

Skills (S)	
A.Core Skills/ Generic Skills	**Writing Skills**
	The individual on the job must be able to: CS1. Issue instructions, recommendations and commendations in writing CS2. Conduct performance assessments and develop performance reports
	Reading Skills
	The individual on the job must be able to: CS3. Read and understand leadership courses
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS4. Manage meetings and discussions. CS5. Provide feedback on Strength Weaknesses, Opportunities and Threats for the business CS6. Give instructions to the team CS7. Listen attentively and comprehend information given by the speaker
B.Professional Skills	**Decision Making**
	The individual on the job must be able to: PS1. Decide whether the business plan will contribute significantly to the society by improving health care service delivery while assessing the financial risks related to the business.
	Plan and Organise
	The individual on the job must be able to: PS2. Plan, Organise, Lead and Control business activities. PS3. Use the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis in their functional area of responsibility.
	Customer Centricity
	The individual on the job should be able to: PS4. Follow code of conduct relating to the setting up of the business and ensure that a product or service offered meets the set national standards to meet customer expectations.
	Problem Solving
	The individual on the job must be able to: PS5. Solve complex problems diligently within the business PS6. Identify problems, apply appropriate problem solving techniques and assertive in decision making PS7. Consult widely and identify possible remedies
	Analytical Thinking
	The individual on the job should be able to: PS8. Analyse and categorise the challenges that affected the setting up of the business plan. PS9. Solve problems quickly and effectively using a methodical step-by-step approach to thinking and break down complex problems into single and manageable components.
	Critical Thinking
	The individual on the job must be able to: PS10. Use common sense and make judgments in day to day activities

	PS11. Use reasoning skills to identify and resolve basic problems PS12. Use intuition to identify any potential problems which could arise during business operations

UNIT 8 [This Unit covers the skills and knowledge of a Biomedical Scientist in demonstrating leadership and management at a place of work].

Unit No.	**08**
Unit Title	**Leadership and Management**
Description	This Unit covers the skills and knowledge required by a Biomedical scientist in leading and managing his subordinates at a place of work].
Scope	This unit covers the following: • Communicate effectively at the workplace • Carry out basic management and leadership functions of planning, organising, staffing, leading and controlling • Contribute to team and self-development
Performance Criteria (PC) with respect to the Scope	
Element	**Performance Criteria (PC)**
Communicate effectively at the workplace	To be competent, the individual must be able to: PC1. Describe the importance of team based activities and clearly highlight the key responsibilities they have as a team member. PC2. Identify internal and external stakeholders and their expectations. PC3. Apply available and appropriate feedback mechanisms. PC4. Understand the communication channels and the associated hierarchies
Carry out basic management and leadership functions of planning, organising, staffing, leading and controlling	To be competent, the individual must be able to: PC5. Decide on the plans and take the necessary steps to \ achieve the objectives PC6. Delegate tasks and allocate resources to individuals PC7. Determine the manpower requirements in the working area and decide their placement. PC8. Motivate and lead the staff for timely achievements of the goals. PC9. Regularly monitor the progress of work in line with the agreed objectives or targets. PC10. Collaboration with HR personnel, be able to conduct training and awareness on code of conduct and company's grievance procedure. PC11. Use interpersonal skills to motivate the staff to enhance performance in line with set targets
Contribute to team and self-development	To be competent, the individual must be able to: PC12. Describe self-management practices and how they apply to overall team activities in the workplace PC13. Describe the importance of initiating feedback, as a team member, towards the overall team development. PC14. Describe the importance of sharing knowledge and experiences for the sake of team development. PC15. Conduct gap analysis to determine training needs for all Subordinates

Knowledge and Understanding (K)	
A.Organisation-(Knowledge of the whole organization and its processes)	The individual on the job must be able to demonstrate knowledge and understanding of: OK1. Company communication procedures and organogram. OK2. Modes of communication and their associated restrictions if any OK3. Company code of ethics.
B.Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: TK1: Knowing how to use computers and other laboratory Equipment. TK2: Testing samples to know the underlying problem in a patient. TK3: Maintaining accurate data and records and producing medical reports TK4: Conflict and problem-solving skills.
C.Regulatory Knowledge (Knowledge of rules and regulation)	The individual on the job must demonstrate knowledge and understanding of: RK1. Relevant Occupational Health and Safety laws RK2. Relevant Industrial and Labour relations Laws RK3. Relevant Workers Compensation Act RK4. Relevant Employment Regulations
Skills (S)	
A.Core Skills/ Generic Skills	**Writing Skills**
	The individual on the job must be able to: CS1. Write in the English Language proficiently and/or have the means to write complex instructions in reports and SOPs CS2. Prepare and provide clear and detailed instructions, details of pathways and sketches to co-workers CS3. Write concise and detailed notes during an experiment. CS4. Write accurate observations during an experiment CS5. Write reports into research papers for publication.
	Reading Skills
	The individual on the job must be able to: CS6. Read the English language proficiently and be able to or have the means to give detailed instructions CS7. Read and interpret complex, sketches, operating manual, drawings or instructions provided for the required work and pathology reports.
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS8. Listen attentively and interpret communication and instructions from the supervisor and other co-workers CS9. Convey information clearly and concisely to co-workers

B.Professional Skills	**Decision Making**
	The Individual on the job holder must be able to: PS1: Collect feedback from team members to ideate a new team workflow PS2: Research market trends to understand how they will impact company strategy and overall direction of the laboratory. PS3. Learn from mistakes and use data to develop better solutions PS4. Analyze situations based on facts and data, not assumptions or emotions
	Plan and Organise
	The individual on the job must be able to: PS5. Plan and organise what, when, who, and how communicate based on company communication guidelines. PS6: Divide his or her goals into smaller units and setting deadlines for them. PS7: Decide when to do each task in a project based on your workload and deadlines
	Customer Centricity
	The individual on the job must be able to: PS8: Posses deep understanding of people, their joys, their struggles, their lives, their environments, their neighbourhoods and really all of their contexts PS9: Understand customer's problem in order to solve them. PS10: Exhibit Servant leadership
	Problem Solving
	The individual on the job must be able to: PS11. Active participation in scheduled team activities rendering contributions in problem solving and overall decisions of the team PS12. Break down big problems into smaller one PS13. Be Persistent PS14: To ask for help in times of uncertainty
	Analytical Thinking
	The individual on the job must be able to: PS15. Brainstorm creative solutions and narrow down to most logical one PS16. Gather information through testing and observation PS17. Develop solutions or deepening your understanding of the topic PS18. Design learning and development programs that meet the company's needs. PS19. Quantification and Forecasting
	Critical Thinking
	The individual on the job must be able to: PS20.Make solid arguments. PS21. Use reasoning skills to come to a logical conclusion. PS27. Identify biases

5. EQUIPMENT, TOOLS AND CONSUMABLE MATERIALS

These include, but not limited to:

Equipment and Tools:
Haematology Blood Analyser, Chemistry Analyser, Flow Cytometer, Centrifuges Tissue processers and strainers, incubators, autoclaves, Microscopes, Blood culture Machines, water bath, PCR Machines, ELISA Machine, Fridge's, Freezers, Oven, Safety cabinets and biological safety cabinets, HPLS systems, scales and balances, Hot plates, Mass spectrometers, CO_2 Incubators, Cell counters, Microplate readers, PH meters, Blood gas analysers, Spectrophotometry etc.

Consumables:
Pipettes, Gloves, Cotton wool, Methylated spirits, coverslips, Microscope slides, Specimen containers, centrifuge tubes, filter papers, Masks, plastic disposable cuvettes, lancets, cryovials, capillary tubes, Microtomes, cell culture dishes and plates, syringes, Phlebotomy needles and tubes, reagent bottles, Staining solutions, filter tips, Paraffin wax for tissue embedding, swabs, Microbiology culture media, pipette tips etc.

6. DILEMMAS/CHALLENGES AND COMPLEXITIES FOR A JOB HOLDER

Biomedical Scientists face challenges such as obsolete and/or inappropriate equipment and tools, budgetary constraints, inadequate product costing skills, poor technical skill base, bureaucracy in procurement procedures, lack of appreciation of preventive maintenance by non-biomedical scientist management staff, labour intensive nature of the work, rapid change of technology and materials, lack of personal protective equipment, climate change, cyber warfare, inconsistencies in company and government policies and regulations, etc.

6.1 Alternative Choices (Solutions) to Dilemmas and Complexities

Solutions to challenges include: selecting and procuring appropriate equipment and tools for the job; supporting capacity building through training; identifying and utilizing suitable adaptation and mitigation measure against the effect of climate change; utilizing appropriate cyber security measures to protect against cyber warfare; include biomedical scientist professionals in management teams, deployment of automation where feasible, provision of personal protective equipment, participate in lobbying and formulation of policies, allocation of adequate financial resources, etc.

7. WORKING CONDITIONS/ENVIRONMENT

Biomedical Scientists work with a variety of machinery, toxic substances and volatile materials, radioactive material, infective materials and many other dangerous material. Their work environment is susceptible to fires, explosions, structural failures and equipment malfunctions. Working conditions include, hot conditions where air conditioning is absent, stand/walk for long hours, lifting materials, working in day or night shifts, areas with limited lighting and ventilation, etc.

8. PARTIES INVOLVED/INTERACTING WITH THE JOB HOLDER OR TRAINEE

8.1 Internal/Within the Organisation

Management, supervisors, subordinates and other section members, etc.

8.2 External/Outside the Organisation

Government regulators, professional bodies, clients, suppliers, fellow biomedical scientists from other companies, labour unions, students/interns, etc.

9. PHYSICAL DEMANDS ON THE BODY

- Physique to sustain strenuous conditions;
- Be able to walk and stand for long periods of time;
- Bend, stretch, twist, or reach out;
- Be able to lift relatively heavy materials, tools and equipment;
- Be able to use fingers, hands and feet with ease to complete the assigned task (dexterity);
- Etc.

ANNEX A
Criteria for Assessments based on this NOS

A.1 Guidelines for Assessment

A.1.1 Criteria for assessment for curricula and learning programmes based on this NOS will be created by curricula and programmes developers. Each Performance Criteria (PC) will be assigned marks proportional to its importance in the NOS. Curricula and programmes developers will also lay down proportion of marks for theory and practical skills for each performance criteria, giving more weight to practical skills.

There shall be allocated the 'Total Mark', which will be the sum of all marks in each Unit, distributed across the number of PCs in that particular Unit. The 'out of' mark will be the mark allocated to each PC, which will be shared between theory and skills practical assessments.

A.1.2 Individual awarding/assessment bodies or institutions and other users of the NOS will create unique question papers for the theory part and evaluations for skill practical part for their respective candidates.

ANNEX B
NOS Version Control

This Annex gives details necessary for the tracking of the NOS versions based on the number of revisions.

NOS Code	DNOS.BS.01		
ZQF Level	7	**Version Number**	01
Sector	Health	**Date of Approval**	
Sub Sectors	NGO, Research, Academia, Manufacturing Regulatory	**Date of Last Review**	N/A
Occupation	Biomedical Science	**Date of Next Review**	