



**NATIONAL OCCUPATIONAL STANDARD
FOR SENIOR CHEMIST**

NOS.MB.01 FIRST EDITION

APPROVING AUTHORITY

This National Occupational Standard has been prepared and published under the authority of the Zambia Qualifications Authority Board on 7th May, 2021.

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 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 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 National Occupational Standards (NOS) should ascertain that they are in possession of the latest amendments or editions.

NOS DEVELOPMENT TEAM RESPONSIBLE

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

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FOREWORD

The Zambia Qualifications Authority (ZAQA) is a statutory body under the Ministry of Higher Education established by ZAQA Act No. 13 of 2011 to “**provide for the development and implementation of a national qualifications framework; 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) 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 Mining 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 National Occupational Standards 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 Mining sector, demonstration of competence against this NOS may be required in order to run a business or practice a craft or profession.

JUSTIFICATION

In the mining industry information about mineralogy is key to ore identification, categorisation (resource or reserve), and quantification (minable or not minable) and for environmental management and control. The Senior Chemist is responsible for undertaking sampling, sample handling preparation and analysis in order to generate analytical data for mineral resource classification, metal quantification, process route identification, quality controls, environmental control purpose, trade and investment policy decision making and accreditation.

The Senior Chemist aims at ensuring that sampling, collection and handling of samples, preparation, analysis and archiving is done to the best industrial practices. The Senior Chemist is responsible for communicating the results to inform a decision.

This National Occupational Standard highlights core knowledge, skills/competences and personal attributes that a Senior Chemist must possess to be effective on the job.

ACRONYMS AND ABBREVIATIONS

CS	Core Skill
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
SC	Senior Chemist
TK	Technical Knowledge
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: are 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: is 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: defines a unique set of functions that together form a unique employment opportunity in an organisation.

Knowledge and Understanding: are 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): are 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.

National Occupational Standards (NOS) Code: is a unique reference code that identifies a NOS.

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

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

Organisational Context: includes the way 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: are statements that together specify the standard of performance required when carrying out a task.

Scope: is the 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: is 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: is derived from a further breakdown based on the characteristics and interests of its components.

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

Unit Title: gives a clear 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.SC.01
Occupation	Chemical Analysis
Job Title	Senior Chemist
Role Description	The Senior Chemist produces quality assays of mineral samples (geological, mining and metallurgical)
Job Purpose	The Senior Chemist is responsible for undertaking sampling, sample handling, preparation and analysis in order to generate analytical data for mineral resource classification, metal quantification, process route identification, quality controls, environmental control purpose, trade and investment policy decision making and accreditation.
ZQF Level	7
Sector	Mining
Sub sector	Geotechnical, Mining geology, Metallurgical processing, Environmental Protection and Training
Other Economic Sector(s) in which the Occupation is Practiced	Manufacturing, Agriculture, Research and Development, Construction and Academia
Other Similar Jobs that can be performed by the Senior Chemist	Research and Development, Teaching and Consultancy
Minimum Educational Job Entry Qualification(s)	Bachelor of Science degree in chemistry or equivalent
Practicing License Requirements (if any)	NA
Training/RPL (Suggested but not mandatory)	<ol style="list-style-type: none"> 1. Geotechnical Survey 2. Mine safety 3. Statistical evaluation 4. Quality control 5. Supervisory 6. Communication skills 7. Forensics 8. Basic metallurgy 9. Training in Quality Management Systems (QMS) .e.g. ISO 17025, ISO 90001 10. Theory of sampling and sample preparation 11. Metallurgical accounting techniques Quality Control and Quality Assurance
Minimum Job Entry Age	21 years
Prior Experience (Suggested)	Having worked as Chemist before or having worked as a Lab technologist before.
Performance Criteria	As described in the Units under Section 4

2. SCOPE

This National Occupational Standard specifies the fundamental knowledge and understanding, skills and competences that Senior Chemists must possess to be successful on the job.

3. PERSONAL ATTRIBUTES (VALUES, ETHICS AND ATTITUDES)

This job requires an individual demonstrate:

- Good interpersonal skills,
- Integrity and accountability.
- Logical thinking and reasoning
- Ability to pay attention to detail
- Critical thinking
- Sober mindedness
- Confidentiality
- Self-driven and
- Safety conscious.

4. UNITS AND ELEMENTS

This National Occupational Standard for the Senior Chemist is divided into 5 units representing the tasks that a job holder should undertake in his/her day to day work. Each unit is further broken down into elements depicting the number of activities to be carried out for the effective execution of tasks.

UNIT 1. [This unit is about preparing for sampling activities using prescribed standard operating procedures for geological, mining, metallurgical/ process and environmental samples.

Unit No.	01
Unit Title	Sampling and Sample preparation
Description	Describes series of operations and actions taken to cut the sample and prepare it for analysis
Scope	This unit covers the following: <ul style="list-style-type: none"> • Preparation for sampling • Obtaining representative sample • Sample preparation • Maintaining sample integrity
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria (PC)
Preparation for sampling	To be competent, the individual must be able to: PC1. Understand the appropriate sampling techniques PC2. Understand the tools and equipment relevant for the material or stream to be sampled. PC3. Understand the purpose for the sample by the Client – Process control or accounting. PC4. Understand the environment in which samples are taken PC5. Ensure safe handling, packaging and transportation of samples PC6. Effectively communicate results in accordance with laid down quality control and quality assurance procedures. PC7. Ensure that quality controls and quality assurance procedures meet industry standards. PC8. Effectively supervise subordinates. PC9. Demonstrate awareness of safety procedures and protocols. PC10. Develop and evaluate appropriate SWP or SOP for sample materials. PC11. Identify and review sampling errors inherent in the SWP or SOP. PC12. Ensure that Sampling resources are mobilised
Obtaining representative sample	To be competent, the individual must be able to: PC13. Understand the quantitative and qualitative sampling techniques and methods PC14. Ensure sample traceability requirements and labelling are accurately maintained. PC15. Use standard methods and techniques to obtain representative sample.
Sample preparation	To be competent, the individual must be able to: PC16. Ensure crushers, pulveriser and ovens ready. PC17. Ensure that the surroundings are clean PC18. Understand the nature of the samples being prepared PC19. Know the size distribution of sample PC20. Know the different methods and equipment of particle size analysis suitable for the sample. PC21. Understand moisture determination requirements PC22. Ensure identification, segregation and traceability of all samples are as per appropriate SWPs or SOPs PC23. Understand sample digestion or palletisation techniques

<p>Maintaining sample Integrity</p>	<p>To be competent, the individual must be able to:</p> <p>PC24. Ensure that samples are well packaged and stored</p> <p>PC25. Ensure proper management of packaging and storage</p> <p>PC26. Employ appropriate sample handling techniques to prevent sample contamination</p> <p>PC27. Ensure samples are properly identified</p> <p>PC28. Ensure all sample preparation equipment pass the required equipment performance criteria before use</p> <p>PC29. Correlate the sample preparation technique to the nature and purpose of the sample i.e screen size, split portions, etc</p> <p>PC30. Ensure good housekeeping protocols are adhered to at all times</p> <p>PC31. Ensure sample packaging maintains material traceability</p> <p>PC32. Ensure adherence to appropriate sample preparation QA and QC protocols</p>
<p>Knowledge and Understanding (K)</p>	
<p>A. Organisational Context (Knowledge of the company/ organisation and its processes)</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>OK1. relevant standards, procedures and policies of the company</p> <p>OK2. company's operating philosophy</p> <p>OK3. processes like procurement, store management, inventory management, and key contact points for assay query resolution</p>
<p>B. Technical Knowledge</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>TK1. Sampling procedures, techniques, equipment and calibrations</p> <p>TK2. Statistical evaluation</p> <p>TK3. Best methods and techniques in chemical analysis</p> <p>TK4. Quality control, quality management systems (QMS) and quality assurance procedures</p> <p>TK5. Innovation and upgrade of equipment and analytical methods</p> <p>TK6. Laboratory Information Management Systems (LIMS) and ISO 17025.</p> <p>TK7. Safety, health and Environment procedures and protocols</p> <p>TK8. Best industry practice</p> <p>TK9. Weighing, measurements and calculations.</p>
<p>C. Regulatory context (Knowledge of Mines Safety Rules and Regulations)</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>RK1. Occupational Health and Safety compliance (Industrial Hygiene) procedures</p> <p>RK2. Safety, health and Environment procedures and protocols</p> <p>RK3. Environmental Management laws and regulations</p> <p>RK4. Relevant Labour laws</p> <p>RK5. International laws and regulations applicable in the industry</p> <p>RK6. Commercial regulation for mass measurements, and any other applicable regulation, e.g. AMIRA Code for metal accounting, ZMA Act.</p>
<p>Skills (S)</p>	
<p>A. Core Skills/ Generic Skills</p>	<p>Writing Skills</p> <p>The individual on the job must be able to:</p> <p>CS1. Clearly write reports</p> <p>CS2. Develop/ review Standard Operating Procedures and Manuals</p>

	<p>CS3. Prepare information documents to internal departments/ internal teams or enter the information in online enterprise resource planning systems under the guidance of the supervisor CS4. Write operating instructions</p>
	<p>Reading Skills</p>
	<p>The individual on the job must be able to: CS5. Read and interpret symbols and measuring instruments CS6. Read and interpret equipment manuals CS7. Research and interpret technical data and manuals, books and other technical literature.</p>
	<p>Oral Communication (Listening and Speaking skills)</p>
	<p>The individual on the job must be able to: CS8. Discuss tasks, schedules and activities with the team CS9. Effectively communicate with the team members CS10. Effectively issue instructions and receive feedback from subordinates CS11. Effectively participate in meetings, discussions and feedback sessions</p>
B. Professional Skills	<p>Plan and Organise</p>
	<p>The individual on the job must be able to: PS1. Develop work schedules and ensure their timely implementation PS2. Plan and keep equipment maintenance and calibration systems PS3. Organise information storage and retrieval PS4. Use the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis in their functional area of responsibility PS5. Keep record of each sample PS6. Archive the samples</p>
	<p>Judgment and Critical Thinking</p>
	<p>The individual on the job must be able to: PS7. Use common sense and intuition to identify any potential problems which may arise during operations and provide solutions to them</p>
	<p>Desire to Learn and Take Initiatives</p>
	<p>The individual on the job must be able to: PS8. Solve complex problem within the required time</p>
	<p>Problem Solving and Decision Making</p>
	<p>The individual on the job must be able to: PS9. Identify problem, apply appropriate problem solving techniques and assertive in decision making PS10. Consult and seek synergies in identifying possible solutions</p>

UNIT 2 [This unit is about testing and analysis of geological, mining, metallurgical/process and environmental samples obtained from the mine and providing the results to the supervisor/management].

Unit No.	02
Unit Title	Test and analyse samples
Description	Describes series of operations and actions taken to prepare samples and conduct analyses
Scope	This unit covers the following: <ul style="list-style-type: none"> Testing and analysis of samples using various techniques
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria (PC)
Test and analyse samples	To be competent, the individual must be able to: <ul style="list-style-type: none"> PC1. Correlate the analysis technique to the nature and purpose of the sample, i.e Wet Chem vs XRF or ICP-OES vs EG and any other appropriate techniques. PC2. Prepare test solutions, compounds and reagents PC3. Prepare and set up equipment PC4. Analyse organic and inorganic compounds PC5. Conducting quality control tests PC6. Conduct research and explore improvement in methods PC7. Advise and coordinate test procedures PC8. Apply techniques like instrumental and classical methods PC9. Confer with other professionals in related fields
Knowledge and Understanding (K)	
A. Organisational Context (Knowledge of the company/ organisation and its processes)	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> OK1. Relevant standards, procedures and policies of the company OK2. The company's operating philosophy OK3. Processes like procurement, store management, inventory management, and key contact points for assay query resolution
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> TK1. Sampling procedures, techniques, equipment and calibrations TK2. Statistical evaluation TK3. Best methods and techniques in chemical analysis TK4. Quality control and quality assurance procedures TK5. Innovation and upgrade of equipment and analytical methods TK6. Safety, health and environment procedures and protocols TK7. Chemistry theories and concepts TK8. Modern microscopy analyses TK9. Various glass ware and other accessories required TK 10. Laboratory Information Management Systems. TK 11. ISO 17025:2015 Standard specifications for Testing Laboratories. TK 12. Statistical Method Validation techniques. TK 12. SPC techniques for competent laboratories

<p>C. Regulatory context (Knowledge of Mines Safety Department Rules and Regulations)</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <ul style="list-style-type: none"> RK1. Occupational Health and Safety compliance (Industrial Hygiene) procedures RK2. Mine Healthy and Safety Regulations and policies RK3. Environmental Management laws and regulations RK4. Relevant Labour laws. RK5. International laws and regulations applicable in the industry
<p>Skills (S)</p>	
<p>A. Core Skills/ Generic Skills</p>	<p>Writing Skills</p>
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS1. Clearly write reports CS2. Develop/ review Standard Operating Procedures and Manuals CS3. Prepare information documents to internal departments/ internal teams or enter the information in online enterprise resource planning systems under the guidance of the supervisor CS4. Write operating instructions
	<p>Reading Skills</p>
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS5. Read and interpret symbols and measuring instruments CS6. Read and interpret equipment manuals CS7. Research and interpret technical data and manuals, books and other technical literature.
<p>B. Professional Skills</p>	<p>Oral Communication (Listening and Speaking skills)</p>
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS8. Discuss tasks, schedules and activities with the team CS9. Effectively communicate with the team members CS10. Effectively issue instructions and receive feedback from subordinates CS11. Effectively participate in meetings, discussions and feedback sessions
<p>B. Professional Skills</p>	<p>Plan and Organise</p>
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> PS1. Develop work schedules and ensure their timely implementation PS2. Plan and keep equipment maintenance and calibration systems PS3. Organise information storage and retrieval PS4. Inspect prepared samples to determine their readiness PS5. Set up equipment and tools to be used in the analysis PS6. Utilise basic statistics in evaluating results PS7. Use effective communication skills PS8. Plan and request for purchase of new laboratory supplies and equipment PS9. Develop close links with departmental members, consumers and suppliers PS10. Evaluate and ensure compliance with laboratory safety procedures and standards PS11. Effectively and efficiently utilise different types of analytical methods and equipment PS12. Ensure that quality controls and quality assurance procedures meet industry standards PS13. Effectively supervise subordinates

	Judgment and Critical Thinking
	The individual on the job must be able to: PS14. Use common sense and intuition to identify potential problems and provide solutions to them PS15. Make sound judgement PS16. Demonstrate detail orientation and logical thinking
	Desire to Learn and Take Initiatives
	The individual on the job must be able to: PS17. Show inquisitive and willingness to furthering scientific knowledge and improving processes and products
	Problem Solving and Decision Making
	The individual on the job must be able to: PS18. Identify problems, apply appropriate problem solving techniques and assertive in decision making PS19. Consult and seek synergies in identifying possible solutions PS20. Solve complex problems within the required time PS21. Demonstrate strong problem solving skills and decision making on evaluated data

UNIT 3 [This unit is about development and validation of new method or technique to ensure test data is accurate, precise and consistent in the preparation and analysis of geological, mining, metallurgical/ process and environmental samples].

Unit No.	03
Unit Title	Method development and validation
Description	This unit is about developing and validating new method for use in the laboratory
Scope	This unit covers the following: <ul style="list-style-type: none"> • Development of test method • Validation of test method
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria (PC)
Development of the test method	To be competent, the individual must be able to: PC1. Identify a method to be developed PC2. Set up apparatus to be used in development of the method PC3. Establish scope of the test method PC4. Prepare reference materials and standards PC5. Determine procedure for method development PC6. Demonstrate awareness of safety procedures and protocols PC7. Determine criteria for approval/ rejection PC8. Document the method into SOPs PC9. Train staff on the new method PC10. Effectively communicate results in accordance with procedures PC 11. set up of experiment to determine parameters such as bias/recovery, precision, measurement uncertainty, linearity and limit of detection for the method being validated
Validation of the test method	To be competent, the individual must be able to: PC12. Determine method requiring validation PC13. Understand guidelines on general principles of validation PC14. Set out guidelines for method validation PC15. Set out validation parameters in line with international guidelines PC16. Prepare a validation protocol PC17. Prepare procedure for estimating uncertainty PC18. Consider safety measures to be observed PC19. Determine criteria for approval/ rejection PC20. Keep record of validated data PC21. Subject validated method to proficient tests
Knowledge and Understanding (K)	
A. Organisational Context (Knowledge of the company/ organisation and its processes)	The individual on the job must demonstrate knowledge and understanding of: OK1. Relevant standards, procedures and policies of the company OK2. The company's operating philosophy OK3. Processes like procurement, store management, inventory management, and key contact points for assay query resolution
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of:

	<p>TK1. Sampling procedures, techniques, equipment and calibrations</p> <p>TK2. Statistical methods</p> <p>TK3. Best methods and techniques in chemical analysis</p> <p>TK4. Quality control and quality assurance procedures</p> <p>TK5. Innovation and upgrade of equipment and analytical methods</p> <p>TK6. Safety and healthy procedures and protocols</p> <p>TK7. Best industry practice</p> <p>TK8. Laboratory information</p>
C. Regulatory context (Knowledge of Mines Safety Department Rules and Regulations)	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>RK1. Occupational Health and Safety compliance (Industrial Hygiene) procedures</p> <p>RK2. Mine Healthy and Safety Regulations and policies</p> <p>RK3. Environmental Management laws and regulations</p> <p>RK4. Relevant Labour laws.</p> <p>RK5. International laws and regulations applicable in the Industry</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>The individual on the job must be able to:</p> <p>CS1. Clearly write reports</p> <p>CS2. Develop/ review Standard Operating Procedures and Manuals</p> <p>CS3. Prepare information documents to internal departments/ internal teams or enter the information in online enterprise resource planning systems under the guidance of the supervisor</p> <p>CS4. Write operating instructions</p>
	Reading Skills
	<p>The individual on the job must be able to:</p> <p>CS5. Read and interpret symbols and measuring instruments</p> <p>CS6. Read and interpret equipment manuals</p> <p>CS7. Research and interpret technical data and manuals, books and other technical literature</p>
B. Professional Skills	Oral Communication (Listening and Speaking skills)
	<p>The individual on the job must be able to:</p> <p>CS8. Discuss tasks, schedules and activities with the team</p> <p>CS9. Effectively communicate with the team members</p> <p>CS10. Effectively issue instructions and receive feedback from subordinates</p> <p>CS11. Effectively participate in meetings, discussions and feedback sessions</p>
	Plan and Organise
	<p>The individual on the job must be able to:</p> <p>PS1. Develop work schedules and ensure their timely implementation</p> <p>PS2. Plan and keep equipment maintenance and calibration systems</p> <p>PS3. Organise information storage and retrieval</p> <p>PS4. Use the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis in their functional area of responsibility</p>
	Judgment and Critical Thinking
	The individual on the job must be able to:

	PS5. use common sense and intuition to identify any potential problems which may arise during operations and provide solutions to them
	Desire to Learn and Take Initiatives
	The individual on the job must be able to: PS6. solve complex problem within the required time
	Problem Solving and Decision Making
	The individual on the job must be able to: PS7. Identify problem, apply appropriate problem solving techniques and assertive in decision making PS8. Consult and seek synergies in identifying possible solutions

UNIT 4 [This Unit is about applying leadership and supervisory skills].

Unit No.	04
Unit Title	Application of leadership and supervisory skills
Description	This Unit is about demonstrating competency in leadership and supervision of subordinates
Scope	This Unit covers the following: <ul style="list-style-type: none"> • Delegation of duties and responsibilities, supervision, training and development, and team building
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria (PC)
Delegation of duties and responsibilities, supervision, training and development, and team building	To be competent, the individual must be able to: <ul style="list-style-type: none"> PC1. Demonstrate ability to delegate duties and responsibilities to subordinates as part of training and development PC2. Create synergies within the team by promoting team spirit PC3. Identify training and development opportunities for subordinates PC4. Effectively supervise subordinates PC5. Develop Key Performance Indicators for subordinates which are clear and achievable PC6. Review performance of subordinates against Key Performance Indicators PC7. Provide constructive performance feedback to the subordinates PC8. Recommend competent and high potential subordinates for promotion
Knowledge and Understanding (K)	
A. Organisational Context (Knowledge of the company/ organisation and its processes)	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> OK1. Relevant standards, policies and procedures followed in the company OK2. Organisational roles, responsibilities, accountabilities, and authorities OK3. Organisational strategic goals and objectives
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> TK1. Planning, organising, directing and controlling TK2. Problem solving and decision making TK2. Conflict management TK3. Importance and need for effective communication
C. Regulatory context	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> RK1. Mine safety rules and regulations RK2. Mines and Minerals Development Act, 2015 RK3. Environmental Management Act, 2011 RK4. Occupational Health and Safety Act, 2010 RK5. Factories Act Cap 441 RK6. Workers Compensation Act RK7. Employment Act Chapter 268 and any other relevant labour laws
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
B. Professional Skills	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 team CS6. Give instructions to the team CS7. Listen attentively and comprehend information given by the speaker and safety data sheets
	Plan and Organise
	The individual on the job must be able to: PS1. Plan, Organise, Lead and Control organisational activities. PS2. Use the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis in their functional area of responsibility.
	Analytical Thinking
	The individual on the job must be able to: PS3. Solve problems quickly and effectively using a methodical step-by-step approach to thinking and break down complex problems into single and manageable components.
	Judgment and Critical Thinking
	The individual on the job must be able to: PS4. Use common sense and make judgments in day to day activities PS5. Use reasoning skills to identify and resolve basic problems PS6. Use intuition to identify any potential problems which could arise during operations
	Desire to Learn and Take Initiatives
	The individual on the job must be able to: PS7. Demonstrate willingness to explore new ideas PS8. Demonstrate willingness to adopt new ideas to improve performance PS9. Take initiative when required
Problem Solving and Decision Making	
The individual on the job must be able to: PS10. Solve complex problems diligently within the agreed timelines PS11. Identify problems, apply appropriate problem solving techniques and assertive in decision making PS12. Consult widely and identify possible remedies PS13. Escalate when required as per organisation escalation procedure and protocol	

UNIT 5 [This unit is about maintaining health and safety measures critical in mines].

Unit No.	05
Unit Title	Maintain health and safety
Description	This unit is about maintaining health and safety in the mining industry
Scope	This unit covers the following: <ul style="list-style-type: none"> Maintain health and safety measures critical in mines
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria (PC)
Maintain health and safety in the mining Industry	To be competent, the individual must be able to: <ul style="list-style-type: none"> PC1. Comply with occupational health and safety regulations adopted by the employer PC2. Adhere to mining operation procedures with respect to materials handling and accidents PC3. Follow the correct safety steps in case of accidents or major failure PC4. Comply with safety regulations and procedures in case of fire hazards PC5. Conversant with emergency preparedness procedures PC6. Work responsibly and as safely and carefully as possible so as not to put the health and safety of self or others at risk, including members of the public PC7. Perform storage and transportation of hazardous materials compliant with safety guidelines prescribed by Mines Safety Department PC8. Demonstrate knowledge of Personal Protective Equipment PC9. Adhere to manufacturer's instructions for care and safe operation of the equipment
Knowledge and Understanding (K)	
A. Organisational Context (Knowledge of the company/ organisation and its processes)	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> OK1. Relevant standards, policies and procedures followed in the company OK2. Context of the organisation as determined by external factors like legal, financial, social, regulatory and cultural as well as internal factors like internal structures, governance and resource capabilities. OK3. Organisational roles, responsibilities, accountabilities, and authorities OK4. Hazard identification and assessment of risks and opportunities OK5. Management of Change OK6. Emergency preparedness and response OK7. Performance evaluation OK8. Management Systems such as Occupational Health and Safety, Quality and Environmental Management Systems.
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> TK1. Health and Safety Management Systems TK2. Health and Safety Management Standards such as ISO 45001:2018

	<p>TK3. Accident/ Incident investigation skills TK4. Safety Statistics TK5. Hazard Identification and Risk Assessment</p>
C. Regulatory context (Knowledge of Mines Safety Rules and Regulations)	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>RK1. Mine safety rules and regulations RK2. Mines and Minerals Development Act, 2015 RK3. Environmental Management Act, 2011 RK4. Occupational Health and Safety Act, 2010 RK5. Factories Act Cap 441 RK6. Workers Compensation Act RK7. Employment Act Chapter 268 and any other relevant labour laws</p>
Skills (S)	
A. Core Skills/ Generic Skills	Reading Skills
	The individual on the job must be able to:
	CS1. Research, read and interpret Safety information from manuals, books and any other literature CS2. Read and comprehend written information or communication.
	Writing Skills
	The individual on the job must be able to:
CS3. Produce Safety Reports CS4. Develop/ Review Risk Assessments CS5. Write instructions for the successful implementation of Safety in a workplace CS6. Use conversational communication methods such as E-mails CS7. Communicate effectively through writing.	
Oral Communication (Listening and Speaking skills)	
The individual on the job must be able to:	
CS8. Manage meetings and discussions. CS9. Provide feedback on Safety Performance CS10. Give instructions to the team CS11. Listen attentively and comprehend information given by the speaker	
B. Professional Skills	Plan and Organise
	The individual on the job must be able to:
	PS1. Plan, Organise, Lead and Control organisational activities. PS2. Use the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis in their functional area of responsibility.
Judgment and Critical Thinking	
The individual on the job must be able to:	
PS3. Use common sense and make judgments in day to day activities PS4. Use reasoning skills to identify and resolve basic problems PS5. Use intuition to identify any potential problems which could arise	

	Desire to Learn and Take Initiatives
	The individual on the job must be able to: PS6. Demonstrate willingness to explore new ideas PS7. Demonstrate willingness to adopt new ideas to improve performance PS8. Take initiative when required.
	Problem Solving and Decision Making
	The individual on the job must be able to: PS9. Solve complex problems diligently within the agreed timelines. PS10. Identify problems, apply appropriate problem solving techniques and assertive in decision making PS11. Consult widely and identify possible remedies PS12. Escalate when required as per organisation escalation procedure and protocol

5. EQUIPMENT, TOOLS AND CONSUMABLE MATERIALS

The Senior Chemist must ensure that he/she has modern and up to date tools, analytical and sampling equipment, and consumables to ensure that he/she produces quality assays.

6. DILEMMAS/CHALLENGES AND COMPLEXITIES FOR A JOB HOLDER

Dilemmas associated with the job of a Senior Chemist include: working with poisonous chemicals and materials.

6.1 Alternative Choices (Solutions) to Dilemmas and Complexities

Solutions to dilemmas are: proper storage of chemicals, wearing of PPEs, clearly adhering of instruction and supervision of subordinates.

7. WORKING CONDITIONS/ENVIRONMENT

The Working conditions include: underground and opencast mines, confined spaces, climbing heights, cold and hot conditions, working in day or night shifts, in areas that are noisy and dusty.

8. PARTIES INVOLVED/ INTERACTING WITH THE JOBHOLDER OR TRAINEE

8.1 Internal/Within the Organisation

Superiors, peers, subordinates, process engineers, mining engineers and geologists

8.2 External/Outside the Organisation

Government regulators, trainers, suppliers of equipment/tools/consumables, labour unions, occupational health, safety associations and civil society organisations, etc.

9. PHYSICAL DEMANDS ON THE BODY

- Be able to sit and walkabout for long periods of time
- Looking at a computer for long hours
- Be able to climb heights
- Have no medical impairment such as colour blindness, deafness or epilepsy.

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	NOS.MS.01		
ZQF Level	TBA	Version Number	01
Sector	Mining	Date of Approval	7 th May, 2021
Sub Sector	Underground and Opencast Mines	Date of Last Review	N/A
Occupation	Chemical Analysis	Date of Next Review	May, 2026



Zambia
Qualifications
Authority