

NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING



JANUARY 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: CHEMICAL TESTING TECHNICIAN

LEVEL: NTA 5

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ABBREVIATIONS

AAS	Atomic Absorption Spectrum
CBET	Competency Based Education and Training
GC	Gas Chromatography
HPLC	High Performance Liquid Chromatography
IR	Infrared Spectrum
ISO	International Organization for Standardization
LC	Liquid Chromatography
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
SOP	Standard Operating Procedures
TCA	Total Carbon Analysis
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training
UV/Vis	Ultraviolet/Visible Detection
VOC	Volatile Organic Compound

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a

composite of three completely interdependent components: cognitive, affective, and psychomotor.

- Standards:** A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
- Task Analysis:** The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.
- Task:** A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.
- Underpinning Knowledge:** Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
- Verification Process:** The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical and Vocational Education and Training of Tanzania has begun the job of drafting Occupational Standards that will eventually be adopted as National Occupational Standards for TET in order to ensure that it meets the needs of the labour market and the country's economic agenda.

National Occupational Standards (NOS) are performance criteria that are matched with labour market demands. Each National Occupational Standard describes functions, performance standards, and knowledge/understanding for one important function or task. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruiting, supervision, and appraisal, as well as TET standards. They're also helpful for benchmarking and harmonizing qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current and consistent in delivery across all public and private institutions.

However, it must be noted that, Occupational Standards and Training Standards/Qualifications Standards are different. Occupational Standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical circuits, performs fault in electrical wiring, etc.) and they are usually defined by employers following procedures agreed upon by all stakeholders. Education and Training standards are developed from the activities defined in occupational standards, and they include learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him or her to function at an agreed level in an occupation. Education and Training standards are used to define curricula in training institutions. It is however critical that there must be a direct link between the Occupational Standards and the training standards to respond to demands of the labour market.

In TET delivery, Tanzania adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the Occupational Standards. Occupational Standards are thus the starting point for developing competency-based training (CBET) programmes. TET institutions will be required to benchmark their curricula with relevant Occupational Standards.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training (TET).

The Chemical Testing Technician Occupation has its own set of occupational standards. The document explains how the Occupational Standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The Occupational Standards development process began with an examination of major documents that guide Tanzanian skill development. The *10-year National Skills Development Strategy (2016-2026)* was one of the documents reviewed, and it outlined six (6) economic sectors that should be prioritized when developing skills development programmes.

These sectors include: Transport and Logistics, Tourism and Hospitality, Agribusiness, Construction, Energy and ICT. NACTE labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a workshop comprised of experts and educators with substantial knowledge and experience in the occupation conducted an occupational analysis utilizing the DACUM approach to produce the occupational profile. The analysis resulted in DACUM Charts, which are attached as **Appendix 1** to this document.

The Occupational Standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the Occupational Standards. Engineers, Supervisory Technicians on the job, and experienced Chemical Testing Technicians were key informants in the survey to discover occupational trends. The information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation. A total of online surveys were completed by experts from the labour market across the country. Apart from the survey aiding in defining the scope for the occupational analysis, they also served to engage a wide cross-section of experts in the occupation. Apart from this, the stakeholders' forum was attended by ... participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR CHEMICAL TESTING TECHNICIANS

The standards cover a broad range of duties and tasks that can be performed by Chemical Testing Technicians. However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in

specific settings or positions. Chemical Testing Technicians may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

Chemical Testing Technicians work under the supervision of engineers in the form of sampling inspection. They shall use chemical analysis instruments and physical and chemical instruments and other equipment to complete the inspection, detecting, testing, monitoring and analysis of the finished, semi-finished and raw materials, and intermediate processes of chemical products such as chemical reagents, daily chemicals, silicates, fertilizers, pesticides, coatings, coal coking, and petroleum. Generally, the Chemical Testing Technician performs the following responsibilities:

- a) Sample collection and preparation
- b) Solution preparation
- c) Instruments and equipment preparation
- d) Detection of physical parameters and performance
- e) Chemical analysis
- f) Instrumental analysis
- g) Microbiological inspection
- h) Maintenance and servicing of instruments and equipment for analysis and test
- i) Analysis of typical industrial raw materials and products
- j) Data recording
- k) Result reporting
- l) Quality control

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA 4, 5 and 6.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR CHEMICAL TESTING TECHNICIAN - NTA 5

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SAMPLE COLLECTION AND PREPARATION	DUTY NO.	501
TASK TITLE	DESIGN OF A SAMPLE COLLECTION PROGRAM	TASK NO.	5011
PERFORMANCE CRITERIA	The person performing this task must be able to design sample collection programs in accordance with the sample types, inspection tasks and relevant regulations and standards.		
RANGE STATEMENT	<p>The task can be performed at the sampling location (indoor or outdoor) under the supervision of a Chemical Testing Engineer.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Relevant technical requirements and standard documents for sample collection; 2. Computers. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Interpret and implement the design principles of the sampling plan; 2. Determine the detection purposes and items; 3. Conduct survey preparations; 4. Analyse and determine the specific operation methods of sampling; 5. Identify safety issues during sampling; 6. Demonstrate the feasibility of the sampling plan; 7. Report the sampling design scheme. 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Clarify the detection purposes and items; 1.2 Conduct background investigations and site surveys; 1.3 Analyse and develop sampling plans; 1.4 Demonstrate sampling plans; 1.5 Report the sampling design scheme. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Principles for formulating sample collection programs; 2.2 Methods of sample collection. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p> <ol style="list-style-type: none"> 3.1 Purpose and significance of sample collection; 3.2 Basic requirements for sample collection; 3.3 General procedures for sample collection; 3.4 Sampling methods for solid samples; 3.5 Sampling methods for liquid samples; 3.6 Sampling methods for gas samples; 	

	<p>3.7 Precautions of sampling.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Computer skills;</p> <p>4.3 Customer service skills;</p> <p>4.4 Written expression skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Sampling plans are designed in accordance with operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Chemical operation safety; 2. Occupational health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SAMPLE COLLECTION AND PREPARATION	DUTY NO.	501
TASK TITLE	SIMPLE SAMPLE PRETREATMENT	TASK NO.	5012
PERFORMANCE CRITERIA	The person performing this task must be able to finish simple sample pretreatment in accordance with the sample types, inspection tasks and relevant regulations and standards.		
RANGE STATEMENT	<p>The task can be performed in the sample preparation room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Sample delivery receipts; 2. Technical requirements and related standards for sample pretreatment; 3. Experimental consumables such as reagents, beakers, volumetric flasks, and wash bottles; 4. Experimental instruments such as muffle furnaces, electric furnaces, microwave digestion furnaces, analytical balances, and platform scales; 5. Personal protective equipment such as protective gloves, goggles, and lab gowns. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Design simple sample pretreatment schemes; 2. Prepare experimental consumables such as reagents and glass instruments; 3. Set up the experimental site; 4. Wear personal protective equipment; 5. Prepare experimental solutions and debug experimental instruments; 6. Use pretreatment methods such as dissolution method, wet digestion, pyrolysis and microwave digestion to complete the sample pretreatment; 7. Clean instruments and experimental sites; 8. Treat waste solutions; 9. Process experimental data; 10. Report experimental results; 11. Submit for inspection. 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult technical requirements and related standards for sample pretreatment; 1.2 Develop pretreatment schemes; 1.3 Complete the experimental operations of pretreatment such as dissolution method, wet digestion, pyrolysis, and microwave digestion; 1.4 Maintain experimental instruments; 1.5 Ensure personal safety; 1.6 Treat waste solutions. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Sample pretreatment for inorganic component analysis. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p>	

	<p>3.1 Principles of sample pretreatment;</p> <p>3.2 Sample pretreatment methods and principles of inorganic component analysis;</p> <p>3.3 Use and maintenance methods of instruments.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Computer skills;</p> <p>4.3 Customer service skills;</p> <p>4.4 Written expression skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Sample pretreatment is conducted and samples are submitted for inspection in accordance with operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Chemical operation safety; 2. Occupational health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SAMPLE COLLECTION AND PREPARATION	DUTY NO.	501
TASK TITLE	PRETREATMENT OF COMPLEX SAMPLES	TASK NO.	5013
PERFORMANCE CRITERIA	The person performing this task must be able to complete the pretreatment of complex samples in accordance with the sample types, inspection tasks and relevant regulations and standards.		
RANGE STATEMENT	<p>The task can be performed in the sample preparation room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Sample delivery receipts; 2. Technical requirements and related standards for sample pretreatment; 3. Experimental consumables such as reagents, beakers, volumetric flasks, and wash bottles; 4. Experimental instruments such as muffle furnaces, electric furnaces, filter devices, suction filter devices, distillation apparatus, extraction devices, analytical balances, and platform scales; 5. Personal protective equipment such as protective gloves, goggles, and lab gowns. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Design pretreatment schemes of complex samples; 2. Prepare experimental consumables such as reagents and glass instruments; 3. Set up the experimental site; 4. Wear personal protective equipment; 5. Prepare experimental solutions and debug experimental instruments; 6. Use precipitation separation, solvent extraction, ion exchange separation and other pretreatment methods to complete the sample pretreatment; 7. Clean instruments and experimental sites; 8. Treat waste solutions; 9. Process experimental data; 10. Report experimental results; 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult technical requirements and related standards for sample pretreatment; 1.2 Formulate pretreatment schemes of complex samples; 1.3 Complete the experimental pretreatment such as precipitation separation, solvent extraction, and ion exchange separation; 1.4 Maintain experimental instruments; 1.5 Ensure personal safety; 1.6 Treat waste solutions. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Sample pretreatment for organic component analysis. <p>3.0 Theories</p>		

<p>11. Submit for inspection.</p>	<p>The person performing this task must be able to explain the following:</p> <p>3.1 Principles of sample pretreatment;</p> <p>3.2 Sample pretreatment methods and principles of organic component analysis;</p> <p>3.3 Use and maintenance methods of instruments.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Computer skills;</p> <p>4.3 Customer service skills;</p> <p>4.4 Written expression skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>The pretreatment of complex samples is conducted and samples are submitted for inspection in accordance with operation specifications and requirements.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Chemical operation safety; 2. Occupational health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DETECTION OF PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	502
TASK TITLE	DETERMINATION OF THE CRYSTALLIZATION POINT (SOLIDIFICATION POINT) OF LIQUID SAMPLES	TASK NO.	5021
PERFORMANCE CRITERIA	The person performing this task must be able to complete the determination of the crystallization point or solidification point of liquid samples in accordance with technical requirements and relevant standard requirements.		
RANGE STATEMENT	<p>The task can be performed in the physical constant measuring room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, beakers, measuring cylinders, and wash bottles; 4. Experimental instrument such as solidification point tester, and crystallization point tester; 5. Personal protective equipment such as protective gloves, goggles, and lab gowns. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Debug the solidification point tester or crystallization point tester; 5. Operate the solidification point tester to determine the solidification point of the liquid sample; 6. Operate the crystallization point tester to determine the crystallization point of the liquid sample; 7. Maintain the solidification point tester and crystallization point tester; 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Check the relevant standards for the determination of the solidification point or crystallization point; 1.2 Operate the solidification point tester and crystallization point tester; 1.3 Maintain the solidification point tester and crystallization point tester; 1.4 Ensure personal safety; 1.5 Treat waste solutions; 1.6 Process experimental data; 1.7 Report experimental results. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Determination of the solidification point and crystallization point. 	

<p>8. Clean instruments and experimental sites;</p> <p>9. Treat waste solutions;</p> <p>10. Process experimental data;</p> <p>11. Report experimental results.</p>	<p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p> <p>3.1 Category of liquid low-temperature flowability indicators;</p> <p>3.2 Purpose and significance of solidification point and crystallization point determination;</p> <p>3.3 Basic principles of solidification and crystallization;</p> <p>3.4 Influencing factors of solidification point and crystallization points;</p> <p>3.5 Functions and structures of solidification point and crystallization point tester;</p> <p>3.6 Basic requirements for experimental data processing;</p> <p>3.7 Basic requirements for laboratory safety and three wastes treatment.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Report writing skills.</p> <p>5.0 Math Skills</p> <p>5.1 Numerical computation;</p> <p>5.2 Statistics.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>The solidification point or crystallization point of the sample is determined and the test report is written in accordance with the operation specifications and requirements.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Chemical operation safety; 2. Occupational safety and health.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DETECTION OF PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	502
TASK TITLE	DETERMINATION OF THE SPECIFIC ROTATION OF LIQUID SAMPLES	TASK NO.	5022
PERFORMANCE CRITERIA	The person performing this task must be able to complete the determination of the specific rotation of liquid samples in accordance with technical requirements and relevant standard requirements.		
RANGE STATEMENT	<p>The task can be performed in the physical constant measuring room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, beakers, measuring cylinders, volumetric flasks, wash bottles, and glass rods; 4. Experimental instruments such as polarimeters, and automatic polarimeters; 5. Personal protective equipment such as protective gloves, goggles, and lab gowns. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Prepare the experimental solution; 5. Calibrate the polarimeter; 6. Operate the polarimeter to determine the specific rotation of the liquid sample; 7. Maintain polarimeters; 8. Clean instruments and experimental sites; 9. Treat waste solutions; 10. Process experimental data; 11. Report experimental results. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for the determination of specific rotation; 1.2 Operate polarimeters; 1.3 Maintain polarimeters; 1.4 Ensure personal safety; 1.5 Treat waste solutions. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Determination of specific rotation. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p> <ol style="list-style-type: none"> 3.1 Purpose and significance of specific rotation determination; 3.2 Specific rotation determination methods; 3.3 Influencing factors of specific rotation; 		

	<p>3.4 Functions and structures of polarimeters;</p> <p>3.5 Basic requirements for experimental data processing;</p> <p>3.6 Basic requirements for laboratory safety and three wastes treatment.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Computing skills;</p> <p>4.5 Report writing skills.</p> <p>5.0 Math Skills</p> <p>5.1 Numerical computation;</p> <p>5.2 Statistics.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The specific rotation of the sample is determined and the test report is written in accordance with the operation specification and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Chemical operation safety; 2. Occupational safety and health.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DETECTION OF PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	502
TASK TITLE	DETERMINATION OF THE REFRACTIVE INDEX OF LIQUID SAMPLES	TASK NO.	5023
PERFORMANCE CRITERIA	The person performing this task must be able to complete the determination of the refractive index of liquid samples in accordance with technical requirements and relevant standard requirements.		
RANGE STATEMENT	<p>The task can be performed in the physical constant measuring room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, beakers, measuring cylinders, volumetric flasks, wash bottles, and glass rods; 4. Experimental instruments such as Abbe refractometers, and automatic refractometers; 5. Personal protective equipment such as protective gloves, goggles, and lab gowns. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Prepare the experimental solution; 5. Calibrate the refractometer; 6. Operate the refractometer to determine the specific rotation of the liquid sample; 7. Maintain refractometers; 8. Clean instruments and experimental sites; 9. Treat waste solutions; 10. Process experimental data; 11. Report experimental results. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for the determination of refractive index; 1.2 Operate refractometers; 1.3 Maintain refractometers; 1.4 Ensure personal safety; 1.5 Treat waste solutions. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Determination of refractive index. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p> <ol style="list-style-type: none"> 3.1 Purpose and significance of refractive index determination; 3.2 Refractive index determination methods; 		

	<p>3.3 Influencing factors of the refractive index; 3.4 Functions and structures of refractometers; 3.5 Basic requirements for experimental data processing; 3.6 Basic requirements for laboratory safety and three wastes treatment.</p> <p>4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Learning skills; 4.4 Computing skills; 4.5 Report writing skills.</p> <p>5.0 Math Skills 5.1 Numerical computation; 5.2 Statistics.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The refractive index of the sample is determined and the test report is written in accordance with the operation specification and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Chemical operation safety; 2. Occupational safety and health.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DETECTION OF PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	502
TASK TITLE	DETERMINATION OF THE TRACE MOISTURE IN SAMPLES	TASK NO.	5024
PERFORMANCE CRITERIA	The person performing this task must be able to complete the determination of the trace moisture in liquid samples in accordance with technical requirements and relevant standard requirements.		
RANGE STATEMENT	<p>The task can be performed in the chemical analysis laboratory under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, beakers, measuring cylinders, volumetric flasks, transfer pipets, pipettors, wash bottles, and glass rods; 4. Experimental instruments such as Karl Fischer moisture meters (volumetric method, coulometry), analytical balances, and platform scales; 5. Personal protective equipment such as protective gloves, goggles, and lab gowns. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Prepare the experimental solution; 5. Debug the moisture meter; 6. Operate the moisture meter to measure the trace moisture in the sample; 7. Maintain the moisture meter; 8. Clean instruments and experimental sites; 9. Treat waste solutions; 10. Process experimental data; 11. Report experimental results. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for trace moisture determination; 1.2 Operate the Karl Fischer moisture meter; 1.3 Maintain the moisture meter; 1.4 Ensure personal safety; 1.5 Treat waste solutions; 1.6 Process experimental data; 1.7 Report experimental results. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Determination of trace moisture by coulometry; 2.2 Determination of trace moisture by volumetric method. <p>3.0 Theories</p>		

	<p>The person performing this task must be able to explain the following:</p> <p>3.1 Classification of moisture determination methods;</p> <p>3.2 Determination standards of trace moisture by coulometry and volumetric method;</p> <p>3.3 Influencing factors of trace moisture determination;</p> <p>3.4 Functions and structures of the Karl Fischer moisture meter;</p> <p>3.5 Basic requirements for experimental data processing;</p> <p>3.6 Basic requirements for laboratory safety and three wastes treatment.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Computing skills;</p> <p>4.5 Report writing skills.</p> <p>5.0 Math Skills</p> <p>5.1 Numerical computation;</p> <p>5.2 Statistics.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The moisture of samples is determined and the test report is written in accordance with the operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Chemical operation safety; 2. Occupational safety and health.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DETECTION OF PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	502
TASK TITLE	DETERMINATION OF THE DISTILLATION RANGE OF PETROLEUM PRODUCTS	TASK NO.	5025
PERFORMANCE CRITERIA	The person performing this task must be able to complete the determination of the distillation range of petroleum products in accordance with technical requirements and relevant standard requirements.		
RANGE STATEMENT	<p>The task can be performed in the petroleum analysis room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, beakers, measuring cylinders, flasks, thermometers, and condensers; 4. Experimental instruments such as petroleum product distillation range testers; 5. Personal protective equipment such as protective gloves, goggles, and lab gowns. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Debug the petroleum product distillation range tester; 5. Operate the petroleum product distillation range tester to determine the distillation range of gasoline, diesel and other petroleum products; 6. Maintain the petroleum product distillation range tester; 7. Clean instruments and experimental sites; 8. Treat waste solutions; 9. Process experimental data; 10. Report experimental results. 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for the determination of the distillation range of petroleum products; 1.2 Operate the petroleum product distillation range tester; 1.3 Maintain the petroleum product distillation range tester; 1.4 Ensure personal safety; 1.5 Treat waste solutions; 1.6 Process experimental data; 1.7 Report experimental results. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Determination of distillation range of petroleum products; 2.2 Petroleum product quality standards. 	

	<p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p> <p>3.1 Purpose and significance of determination of distillation range of petroleum products;</p> <p>3.2 Determination methods of distillation range of petroleum products;</p> <p>3.3 Influencing factors of distillation range of petroleum products;</p> <p>3.4 Functions and structures of the petroleum product distillation range tester;</p> <p>3.5 Basic requirements for experimental data processing;</p> <p>3.6 Basic requirements for laboratory safety and three wastes treatment.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Computing skills;</p> <p>4.5 Report writing skills.</p> <p>5.0 Math Skills</p> <p>5.1 Numerical computation;</p> <p>5.2 Statistics.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The distillation range of the petroleum products is determined and the test report is written in accordance with the operation specification and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Chemical operation safety; 2. Occupational safety and health.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DETECTION OF PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	502
TASK TITLE	DETERMINATION OF THE FLASH POINT OF PETROLEUM PRODUCTS	TASK NO.	5026
PERFORMANCE CRITERIA	The person performing this task must be able to complete the determination of the flash point of petroleum products in accordance with technical requirements and relevant standard requirements.		
RANGE STATEMENT	<p>The task can be performed in the petroleum analysis room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, beakers, measuring cylinders, and wash bottles; 4. Experimental instruments such as open flash point tester, and closed flash point tester; 5. Personal protective equipment such as protective gloves, goggles, and lab gowns. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Debug the flash point tester; 5. Operate a closed flash point tester to determine the flash point of light petroleum products such as gasoline and diesel; 6. Operate the open flash point tester to determine the flash point of heavy petroleum products such as lubricating oil; 7. Maintain the flash point tester; 8. Clean instruments and experimental sites; 9. Treat waste solutions; 10. Process experimental data; 11. Report experimental results. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for the determination of the flash point of petroleum products; 1.2 Operate open flash point testers and closed flash point testers; 1.3 Maintain the flash point tester; 1.4 Ensure personal safety; 1.5 Treat waste solutions. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Determination of the open cup flash point; 2.2 Determination of the closed cup flash point; 2.3 Petroleum product quality standards. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p>		

	<p>3.1 Purpose and significance of determination of flash point of petroleum products;</p> <p>3.2 Open cup method and closed cup method for the determination of the flash point of petroleum products;</p> <p>3.3 Influencing factors of flash point of petroleum products;</p> <p>3.4 Functions and structures of the petroleum product flash point tester;</p> <p>3.5 Basic requirements for experimental data processing;</p> <p>3.6 Basic requirements for laboratory safety and three wastes treatment.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Computing skills;</p> <p>4.5 Report writing skills.</p> <p>5.0 Math Skills</p> <p>5.1 Numerical computation;</p> <p>5.2 Statistics.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The flash point of petroleum products is determined and the test report is written in accordance with the operation specification and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Chemical operation safety; 2. Occupational safety and health.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DETECTION OF PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	502
TASK TITLE	DETERMINATION OF THE VISCOSITY OF PETROLEUM PRODUCTS	TASK NO.	5027
PERFORMANCE CRITERIA	The person performing this task must be able to complete the determination of the viscosity of petroleum products in accordance with technical requirements and relevant standard requirements.		
RANGE STATEMENT	<p>The task can be performed in the petroleum analysis room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, beakers, measuring cylinders, thermometers, stopwatches, and wash bottles; 4. Experimental instruments such as petroleum product kinematic viscosity testers; 5. Personal protective equipment such as protective gloves, goggles, and lab gowns. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Debug the viscosity tester; 5. Operate the kinematic viscosity tester for petroleum products to determine the kinematic viscosity of petroleum products such as diesel oil and lubricating oil; 6. Maintain the petroleum product kinematic viscosity tester; 7. Clean instruments and experimental sites; 8. Treat waste solutions; 9. Process experimental data; 10. Report experimental results. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for the determination of the kinematic viscosity of petroleum products; 1.2 Operate kinematic viscosity testers for petroleum products; 1.3 Maintain the petroleum product kinematic viscosity tester; 1.4 Ensure personal safety; 1.5 Treat waste solutions. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Determination of the kinematic viscosity of petroleum products; 2.2 Petroleum product quality standards. <p>3.0 Theories</p>		

	<p>The person performing this task must be able to explain the following:</p> <ol style="list-style-type: none"> 3.1 Purpose and significance of determination of viscosity petroleum products; 3.2 Determination methods of kinematic viscosity of petroleum products; 3.3 Influencing factors of viscosity determination of petroleum products; 3.4 Functions and structures of the petroleum product kinematic viscosity tester; 3.5 Basic requirements for experimental data processing; 3.6 Basic requirements for laboratory safety and three wastes treatment. <p>4.0 Essential Skills</p> <ol style="list-style-type: none"> 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Learning skills; 4.4 Computing skills; 4.5 Report writing skills. <p>5.0 Math Skills</p> <ol style="list-style-type: none"> 5.1 Numerical computation; 5.2 Statistics.
DESCRIPTION OF THE END PRODUCT / SERVICE	The flash point of petroleum products is determined and the test report is written in accordance with the operation specification and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Chemical operation safety; 2. Occupational safety and health.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CHEMICAL ANALYSIS	DUTY NO.	503
TASK TITLE	DETERMINATION OF CONSTITUENT CONTENT BY ACID-BASE TITRATION	TASK NO.	5031
PERFORMANCE CRITERIA	The person performing this task must be able to complete solution preparation, prepare basic analytical instruments and equipment, calibrate the capacity of glass measuring instruments, and use acid-base titration to detect the constituent content to be measured in the sample and record data in accordance with the sample types, inspection tasks and relevant regulations and standards.		
RANGE STATEMENT	<p>The task can be performed in the chemical analysis room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, burets, conical bottles, and transfer pipets; 4. Experimental instruments such as electronic analytical balances, and electric furnaces; 5. Personal protective equipment such as protective gloves, goggles, and work clothes. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Use the acid-base titration to determine the constituent content of the sample; 5. Clean instruments and experimental sites; 6. Treat waste solutions; 7. Process experimental data; 8. Report experimental results. 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for the determination of samples by acid-base titration; 1.2 Conduct work preparations required by relevant standards; 1.3 Sort out the work (solution preparation, analysis and determination) procedures and execute them in an orderly manner; 1.4 Maintain and calibrate quantitative analysis instruments; 1.5 Conduct operational safety protection and treat experimental waste solution; 1.6 Process experimental results and write reports. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Basic principles of acid-base titration; 	

	<p>2.2 National metrological verification requirements for commonly-used glass instruments;</p> <p>2.3 Inspection requirements for electronic balances;</p> <p>2.4 Safety management standards of the balance room;</p> <p>2.5 Basic theories of laboratory safety and three wastes treatment.</p> <p>3.0 Theories The tools and equipment to be used include:</p> <p>3.1 The basic standard of acid-base balance;</p> <p>3.2 Precautions for the use of acid-base indicators;</p> <p>3.3 The titration method of monobasic acid and base;</p> <p>3.4 The titration method of polyatomic acid and base;</p> <p>3.5 Preparation and calibration requirements of standard acid-base solutions;</p> <p>3.6 Application methods of acid-base titration.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Writing skills.</p> <p>5.0 Math Skills</p> <p>5.1 Significant figures;</p> <p>5.2 Numerical computation.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The constituent contents are determined and the inspection report forms are written in accordance with the operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Laboratory organization and management; 2. Occupational health and safety; 3. Computer operation; 4. Chemical operation safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CHEMICAL ANALYSIS	DUTY NO.	503
TASK TITLE	DETERMINATION OF CONSTITUENT CONTENT BY COORDINATION TITRATION	TASK NO.	5032
PERFORMANCE CRITERIA	The person performing this task must be able to complete solution preparation, prepare basic analytical instruments and equipment, calibrate the capacity of glass measuring instruments, and use coordination titration to detect the constituent content to be measured in the sample and record data in accordance with the sample types, inspection tasks and relevant regulations and standards.		
RANGE STATEMENT	<p>The task can be performed in the chemical analysis room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, burets, conical bottles, and transfer pipets; 4. Experimental instruments such as electronic analytical balances, and electric furnaces; 5. Personal protective equipment such as protective gloves, goggles, and work clothes. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Use the coordination titration to determine the constituent content of the sample; 5. Clean instruments and experimental sites; 6. Treat waste solutions; 7. Process experimental data; 8. Report experimental results. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for the determination of samples by coordination titration; 1.2 Conduct preparations; 1.3 Sort out the work (solution preparation, analysis and determination) procedures and execute the work in an orderly manner; 1.4 Maintain and calibrate quantitative analysis instruments; 1.5 Conduct operational safety protection and treat experimental waste solution; 1.6 Process experimental results and write reports. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Basic principles of coordination titration; 		

	<p>2.2 National metrological verification requirements for commonly-used glass instruments;</p> <p>2.3 Inspection requirements for electronic balances;</p> <p>2.4 Safety management standards of the analytical balance room;</p> <p>2.5 Basic theories of laboratory safety and three wastes treatment.</p> <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p> <p>3.1 The properties of ethylenediaminetetraacetic acid and the characteristics of its complexes;</p> <p>3.2 Coordination-dissociation balance and its influencing factors;</p> <p>3.3 Coordination titration;</p> <p>3.4 Precautions for the use of metal indicators;</p> <p>3.5 The method to improve the selectivity of coordination titration;</p> <p>3.6 The application method of coordination titration.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Writing skills.</p> <p>5.0 Math Skills</p> <p>5.1 Significant figures;</p> <p>5.2 Numerical computation.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>The constituent content is determined by coordination titration and the inspection report is written in accordance with operation specifications and requirements.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Laboratory organization and management; 2. Occupational health and safety; 3. Computer operation; 4. Chemical operation safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CHEMICAL ANALYSIS	DUTY NO.	503
TASK TITLE	DETERMINATION OF CONSTITUENT CONTENT BY OXIDATION-REDUCTION TITRATION	TASK NO.	5033
PERFORMANCE CRITERIA	The person performing this task must be able to complete solution preparation, prepare basic analytical instruments and equipment, calibrate the capacity of glass measuring instruments, and use oxidation-reduction titration to detect the constituent content to be measured in the sample and record data in accordance with the sample types, inspection tasks and relevant regulations and standards.		
RANGE STATEMENT	<p>The task can be performed in the chemical analysis room under the supervision of senior technicians or chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, burets, conical bottles, and transfer pipets; 4. Experimental instruments such as electronic analytical balances, and electric furnaces; 5. Personal protective equipment such as protective gloves, goggles, and work clothes. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Use the oxidation-reduction titration to determine the constituent content of the sample; 5. Clean instruments and experimental sites; 6. Treat waste solutions; 7. Process experimental data; 8. Report experimental results. 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for the determination of samples by oxidation-reduction titration; 1.2 Conduct preparations; 1.3 Sort out the work (solution preparation, analysis and determination) procedures and execute the work in an orderly manner; 1.4 Maintain and calibrate quantitative analysis instruments; 1.5 Conduct operating safety protection and experimental waste disposal solution; 1.6 Process experimental results and write reports. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Basic principles of the oxidation-reduction titration; 	

	<p>2.2 National metrological verification requirements for commonly-used glass instruments;</p> <p>2.3 Inspection requirements for electronic balances;</p> <p>2.4 Safety management standards of the analytical balance room;</p> <p>2.5 Basic theories of laboratory safety and three wastes treatment.</p> <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p> <p>3.1 The characteristics of oxidation-reduction titration;</p> <p>3.2 Electrode potential requirements;</p> <p>3.3 Titration methods of the oxidation-reduction titration;</p> <p>3.4 Pre-processing before oxidation-reduction titration;</p> <p>3.5 Requirements for the use of potassium permanganate method;</p> <p>3.6 Requirements for the use of potassium dichromate method;</p> <p>3.7 Requirements for the use of iodometric method.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Writing skills.</p> <p>5.0 Math Skills</p> <p>5.1 Significant figures;</p> <p>5.2 Numerical computation.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The constituent content is determined by oxidation-reduction titration and the inspection report is written in accordance with operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Laboratory organization and management; 2. Occupational health and safety; 3. Computer operation; 4. Chemical operation safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CHEMICAL ANALYSIS	DUTY NO.	503
TASK TITLE	DETERMINATION OF CONSTITUENT CONTENT BY PRECIPITATION TITRATION	TASK NO.	5034
PERFORMANCE CRITERIA	The person performing this task must be able to complete solution preparation, prepare basic analytical instruments and equipment, calibrate the capacity of glass measuring instruments, and use precipitation titration to detect the constituent content to be measured in the sample and record data in accordance with the sample types, inspection tasks and relevant regulations and standards.		
RANGE STATEMENT	<p>The task can be performed in the chemical analysis room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, burets, conical bottles, and transfer pipets; 4. Experimental instruments such as electronic analytical balances, and electric furnaces; 5. Personal protective equipment such as protective gloves, goggles, and work clothes. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Use the precipitation titration to determine the constituent content of the sample; 5. Clean instruments and experimental sites; 6. Treat waste solutions; 7. Process experimental data; 8. Report experimental results. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for the determination of samples by precipitation titration; 1.2 Conduct preparations; 1.3 Sort out the work (solution preparation, analysis and determination) procedures and execute the work in an orderly manner; 1.4 Maintain and calibrate quantitative analysis instruments; 1.5 Conduct operating safety protection and experimental waste disposal solution; 1.6 Process experimental results and write reports. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Basic principles of precipitation titration; 		

	<p>2.2 National metrological verification requirements for commonly-used glass instruments;</p> <p>2.3 Inspection requirements for electronic balances;</p> <p>2.4 Safety management standards of the analytical balance room;</p> <p>2.5 Basic theories of laboratory safety and three wastes treatment.</p> <p>3.0 Theories The person performing this task must be able to explain the following:</p> <p>3.1 Conditions for precipitation titration reaction;</p> <p>3.2 Use requirements of Mohr method;</p> <p>3.3 Requirements for using the Volhard method;</p> <p>3.4 Use requirements of Fajans method.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Writing skills.</p> <p>5.0 Math Skills</p> <p>5.1 Significant figures;</p> <p>5.2 Numerical computation.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The constituent content is determined by precipitation titration and the inspection report is written in accordance with operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Laboratory organization and management; 2. Occupational health and safety; 3. Computer operation; 4. Chemical operation safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CHEMICAL ANALYSIS	DUTY NO.	503
TASK TITLE	DETERMINATION OF CONSTITUENT CONTENT BY GRAVIMETRY	TASK NO.	5035
PERFORMANCE CRITERIA	The person performing this task must be able to complete solution preparation, prepare basic analytical instruments and equipment, and use gravimetry to detect the constituent content to be measured in the sample and record data in accordance with the sample types, inspection tasks and relevant regulations and standards.		
RANGE STATEMENT	<p>The task can be performed in the chemical analysis room under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Detection samples; 2. Detection standards and technical requirements documents; 3. Experimental consumables such as reagents, beakers, funnels, and crucibles; 4. Experimental instruments such as electronic analytical balances, muffle furnaces, and dryers; 5. Personal protective equipment such as protective gloves, goggles, and work clothes. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Prepare experimental consumables such as reagents and glass instruments; 2. Set up the experimental site; 3. Wear personal protective equipment; 4. Use the gravimetry to determine the constituent content of the sample; 5. Clean instruments and experimental sites; 6. Treat waste solution; 7. Process experimental data; 8. Report experimental results. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for the determination of samples by gravimetry; 1.2 Operate filter devices and drying or burning devices; 1.3 Maintain filter devices and drying or burning devices; 1.4 Ensure personal safety; 1.5 Treat waste solutions; 1.6 Process experimental results; 1.7 Report experimental results. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Gravimetry; 2.2 National metrological verification requirements for commonly-used glass instruments; 2.3 Inspection requirements for electronic balances; 		

	<p>2.4 Technical requirements for the use of high temperature furnaces;</p> <p>2.5 Safety management standards of the analytical balance room;</p> <p>2.6 Basic theories of laboratory safety and three wastes treatment.</p> <p>3.0 Theories The person performing this task must be able to explain the following:</p> <p>3.1 Classification and characteristics of gravimetry;</p> <p>3.2 Types and selection criteria of precipitants;</p> <p>3.3 Factors influencing the precipitation solubility;</p> <p>3.4 Precipitation formation and conditions;</p> <p>3.5 The application method of the gravimetry.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Writing skills.</p> <p>5.0 Math Skills</p> <p>5.1 Significant figures;</p> <p>5.2 Numerical computation.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The sample constituent content is determined by gravimetry and the inspection report is written in accordance with operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Laboratory organization and management; 2. Occupational health and safety; 3. Chemical operation safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MICROBIOLOGICAL INSPECTION	DUTY NO.	504
TASK TITLE	PREPARATION OF CULTURE MEDIUM	TASK NO.	5041
PERFORMANCE CRITERIA	The person performing this task must be able to complete the preparation of microbial culture medium in accordance with technical requirements and relevant standards.		
RANGE STATEMENT	<p>The task can be performed in the biology laboratory under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Culture medium raw materials such as beef extracts, peptone, and agar; 2. Autoclaves and refrigerators; 3. Tray balances, small aluminum pots, enamel cups with scale, horn spoons, glass rods, small beakers, pH test paper, funnels, funnel supports, tampons, kraft paper, rubber rings, wire frames, test tubes, triangular flasks, and electric furnaces; 4. Detection standards and technical requirements documents; 5. Personal protective equipment such as protective gloves, masks, goggles, and work clothes. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Analyse detection standards and technical requirements documents; 2. Prepare experimental consumables such as reagents and glass instruments; 3. Set up the experimental site; 4. Conduct safety protection; 5. Weigh the raw materials needed for the culture medium; 6. Prepare the culture medium into liquid, semi-solid, solid and other required states; 7. Dispense and wrap the culture medium; 8. Use an autoclave to sterilize the culture medium; 9. Dispose of waste; 10. Record the preparation. 	<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for culture medium preparation; 1.2 Prepare the culture medium into liquid, semi-solid, solid and other required states; 1.3 Dispense and wrap the culture medium; 1.4 Operate the autoclave; 1.5 Conduct safety protection; 1.6 Fill in the original records; <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Safety specifications for the biology laboratory; 2.2 Preparation methods of culture medium. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p>		

	<p>3.1 Principles and methods of culture medium preparation;</p> <p>3.2 Types of culture mediums;</p> <p>3.3 The basic process of culture medium preparation;</p> <p>3.3.1 Weighing and dissolving methods of raw materials;</p> <p>3.3.2 Methods of adjusting pH;</p> <p>3.3.3 Culture medium filtration and clarification methods;</p> <p>3.3.4 Culture medium dispensing requirements;</p> <p>3.3.5 Requirements for tampons and bandages;</p> <p>3.3.6 Requirements for culture medium sterilization.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Written expression skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>The required culture medium is prepared and the data are recorded correctly in accordance with technical requirements and relevant standards.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Use and maintenance of instruments; 2. Laboratory organization and management; 3. Occupational health and safety; 4. Chemical operation safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MICROBIOLOGICAL INSPECTION	DUTY NO.	504
TASK TITLE	INOCULATION AND CULTURE OF MICROORGANISMS	TASK NO.	5042
PERFORMANCE CRITERIA	The person performing this task must be able to complete the inoculation and culture of microorganisms in accordance with technical requirements and relevant standards.		
RANGE STATEMENT	<p>The task can be performed in the biology laboratory under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Slants, plates, culture mediums and other media, and sterile water; 2. Strains; 3. Constant temperature incubators, thermostat water baths, and clean benches; 4. Inoculation rings, inoculation needles, glass spatulas, straws, droppers, alcohol burners, marker pens, and label paper; 5. Detection standards and technical requirements documents; 6. Personal protective equipment such as protective gloves, masks, goggles, and work clothes. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Analyse detection standards and technical requirements documents; 2. Prepare experimental consumables such as reagents and glass instruments; 3. Set up the experimental site; 4. Conduct safety protection; 5. Select culture mediums in different states such as liquid, semi-solid, solid or culture liquids, slants, and plates; 6. Select the appropriate culture medium inoculation method; 7. Select the appropriate strain culture method; 8. Correctly use constant temperature incubator and thermostat water bath; 9. Dispose of waste; 10. Record the inoculation and culture. 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for inoculation and culture of microorganisms; 1.2 Select culture mediums in different states such as liquid, semi-solid, solid or culture liquids, slants, and plates; 1.3 Select the appropriate inoculation method for the culture mediums in different states; 1.4 Select the appropriate culture methods for different strains; 1.5 Operate constant temperature incubators and thermostat water baths; 1.6 Conduct safety protection; 1.7 Fill in the original records. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Safety specifications for the biology laboratory; 2.2 Inoculation and culture of microorganisms. 	

	<p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p> <p>3.1 Inoculation requirements for microorganisms;</p> <p>3.1.1 Requirements for test tube slant inoculation;</p> <p>3.1.2 Technical requirements for liquid inoculation;</p> <p>3.1.3 Technical requirements for solid inoculation;</p> <p>3.1.4 Technical requirements for stab inoculation;</p> <p>3.1.5 Technical requirements for agar plating;</p> <p>3.2 Culture methods of microorganisms;</p> <p>3.2.1 Culture methods of aerobes;</p> <p>3.2.2 Culture methods of anaerobes.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Written expression skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>The microorganism is inoculated and cultured and the data are recorded correctly in accordance with technical requirements and relevant standards.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE</p>	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Use and maintenance of instruments; 2. Laboratory organization and management; 3. Occupational health and safety; 4. Chemical operation safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MICROBIOLOGICAL INSPECTION	DUTY NO.	504
TASK TITLE	DETECTION OF MICROORGANISMS	TASK NO.	5043
PERFORMANCE CRITERIA	The person performing this task must be able to complete the detection of microorganisms in accordance with technical requirements and relevant standards.		
RANGE STATEMENT	<p>The task can be performed in the biology laboratory under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Culture mediums; 2. Constant temperature incubators, thermostat water baths, balances, refrigerators, and microscopes; 3. Sterile petri dishes, sterile straws, sterile glass spatulas, alcohol burners, sterile weighing dishes, alcohol cotton balls, inoculation rings, glass slides, test tube racks, and sterile plates; 4. Samples to be tested; 5. Detection standards and technical requirements documents; 6. Personal protective equipment such as protective gloves, masks, goggles, and work clothes. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Analyse detection standards and technical requirements documents; 2. Prepare experimental consumables such as reagents and glass instruments; 3. Set up the experimental site; 4. Conduct safety protection; 5. Prepare the sample diluents; 6. Culture plating; 7. Select plate dilution and report colony count; 8. Conduct initial fermentation experiments; 9. Conduct isolation and culture experiments; 10. Conduct confirmatory experiments; 11. Make MPN search reports; 12. Dispose of waste; 13. Record the microbe detection. 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Consult the relevant standards for culture medium preparation; 1.2 Conduct microorganism dilution plate counts; 1.3 Use the microorganism dilution culture counting method (MPN method); 1.4 Use the Gram staining method; 1.5 Conduct safety protection; 1.6 Complete the original test records or test reports. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Safety specifications for the biology laboratory; 2.2 Detection of microorganisms. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p>	

	<p>3.1 Requirements of the microorganism dilution plate counting method;</p> <p>3.2 Usage of the microorganism dilution culture counting method (MPN method);</p> <p>3.3 Usage of the Gram staining method;</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Teamwork skills;</p> <p>4.3 Learning skills;</p> <p>4.4 Written expression skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The microorganisms are detected and the original test records or test reports are formed in accordance with technical requirements and relevant standard requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Use and maintenance of instruments; 2. Laboratory organization and management; 3. Occupational health and safety; 4. Chemical operation safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	RESULT REPORTING	DUTY NO.	505
TASK TITLE	CALCULATION OF TEST RESULTS	TASK NO.	5051
PERFORMANCE CRITERIA	The person performing this task must be able to correctly calculate the test results based on the determination data and test result calculation formula.		
RANGE STATEMENT	<p>The task can be performed in the data processing office under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Calculators; 2. Record tables of original data; 3. Data tables of test results. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Use calculators; 2. Substitute the original test data into the test result calculation formula, and perform data rounding and calculation; 3. Fill in data tables of test results. 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Check the completeness and standardization of the test record tables; 1.2 Calculate test results; 1.3 Round off test results; 1.4 Fill in data tables of test results. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Substitution rules of test result calculation formula; 2.2 Significant figure rounding-off and operation requirements. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p> <ol style="list-style-type: none"> 3.1 Representation methods of analysis results; 3.2 Significant figure requirements; 3.3 Methods of rounding significant figures; 3.4 Calculation methods of significant figures. <p>4.0 Essential Skills</p> <ol style="list-style-type: none"> 4.1 Communication skills; 4.2 Written expression skills; 4.3 Learning skills; 	

	<p>4.4 Problem spotting and problem solving skills.</p> <p>5.0 Math Skills</p> <p>5.1 Data operation rules.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The test results are operated and sample data tables of test result are written in accordance with operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Occupational health and safety; 2. Chemical operation safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	RESULT REPORTING	DUTY NO.	505
TASK TITLE	EVALUATION OF TEST RESULTS	TASK NO.	5052
PERFORMANCE CRITERIA	The person performing this task must be able to use the full numerical comparison method or the rounded-off value comparison method to determine whether the test results near the limit numerical value meet the standard requirements.		
RANGE STATEMENT	The task can be performed in the data processing office under the supervision of chemical testing engineers. The tools and equipment to be used include: 1. Calculators; 2. Record tables of original data; 3. Data tables of test results; 4. Standard numerical values; 5. Evaluation tables of test results.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Use calculators; 2. Determine the expression method and judgment method of the limit numerical value; 3. Determine whether the test results near the limit numerical value meet the standard requirements; 4. Fill in evaluation tables of test results. 		<p>Detailed knowledge about:</p> <p>1.0 Methods The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Check the completeness and standardization of the result data tables; 1.2 Calculate the standard numerical value range; 1.3 Determine whether the test results near the limit numerical value meet the standard requirements. <p>2.0 Principles The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Full numerical comparison method; 2.2 Rounded-off value comparison method. <p>3.0 Theories The person performing this task must be able to explain the following:</p> <ol style="list-style-type: none"> 3.1 Precautions for the full numerical comparison method; 3.2 Precautions for the rounded-off value comparison method; 3.3 Methods to fill in the result evaluation tables. <p>4.0 Essential Skills</p> <ol style="list-style-type: none"> 4.1 Calculator skills; 	

	<p>4.2 Learning skills;</p> <p>4.3 Written expression skills;</p> <p>4.4 Digital skills.</p> <p>5.0 Math Skills</p> <p>5.1 Data operation rules.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The test results are evaluated and sample evaluation tables of test results are written in accordance with operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Occupational health and safety; 2. Chemical operation safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	RESULT REPORTING	DUTY NO.	505
TASK TITLE	FILLING IN TEST REPORTS	TASK NO.	5053
PERFORMANCE CRITERIA	The person performing this task must be able to accurately fill in the test report of the sample.		
RANGE STATEMENT	<p>The task can be performed in the data processing office under the supervision of chemical testing engineers.</p> <p>The tools and equipment to be used include:</p> <ol style="list-style-type: none"> 1. Computers; 2. Original test record tables; 3. Data tables of test results; 4. Evaluation tables of test results. 		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
<p>The person performing this task must be able to do the following:</p> <ol style="list-style-type: none"> 1. Use computer office software to design and draw test report tables; 2. Collect relevant materials such as original test record tables, result data tables, and result evaluation tables; 3. Fill in test report tables. 		<p>Detailed knowledge about:</p> <p>1.0 Methods</p> <p>The person performing this task must be able to explain how to:</p> <ol style="list-style-type: none"> 1.1 Check the completeness of the collected record tables; 1.2 Design and draw test reports; 1.3 Fill in test reports. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <ol style="list-style-type: none"> 2.1 Complete content and simple structure of test reports. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p> <ol style="list-style-type: none"> 3.1 Test report structure; 3.2 Test report filling requirements. <p>4.0 Essential Skills</p> <ol style="list-style-type: none"> 4.1 Computer office software application skills; 4.2 Learning skills; 4.3 Written expression skills; 4.4 Aesthetic skills. 	
DESCRIPTION OF THE END PRODUCT / SERVICE		The test reports are filled in and the sample testing report tables are written in accordance with the operation specifications and requirements.	
CIRCUMSTANTIAL KNOWLEDGE		Detailed knowledge about:	
		<ol style="list-style-type: none"> 1. Chemical safety operation; 	

	2. Occupational health and safety.
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TABLE 1: DACUM CHARTS FOR CHEMICAL TESTING TECHNICIAN - NTA 5

DUTIES	TASKS	ENABLERS
1.0 Sample collection and preparation	1.1 Design of sample collection programs.	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Use of communication skills to communicate with others • Basic regulations for sample delivery • Consulting technical requirements and related standards • Knowledge of sample collection and pretreatment • Experimental operation of dissolution method, wet digestion, extraction separation, precipitation separation and other pretreatment • Basic chemistry • Analytical chemistry • Laboratory organization and management • Occupational health and safety <p>Tools and equipment</p> <ul style="list-style-type: none"> • Personal protective equipment such as gloves, goggles and lab gowns • Experimental consumables such as beakers, conical bottles, volumetric flasks, wash bottles, and glass rods • Muffle furnaces, electric furnaces, microwave digestion furnaces, analytical balances, platform scales, distillation apparatuses, extraction devices, filter devices, and extraction devices <p>Materials</p> <ul style="list-style-type: none"> • Experimental reagents, sample delivery tables, and sample inspection tables <p>Requirements for employees</p> <ul style="list-style-type: none"> • Good manner, overall arrangement, teamwork spirit, integrity, and time management
	1.2 Simple sample pretreatment.	
	1.3 Pretreatment of complex samples.	
2.0 Detection of physical parameters and performance	2.1 Determination of the crystallization point (solidification point) of liquid samples.	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Use of communication skills to communicate with others

DUTIES	TASKS	ENABLERS
	2.2 Determination of the specific rotation of liquid samples.	<ul style="list-style-type: none"> • Consulting technical requirements and related standards • Knowledge of petroleum product analysis • Petroleum product analysis instrument operation skills • Petroleum analysis • Analytical chemistry • Maintenance and use of analytical instrument • Laboratory organization and management • Occupational health and safety <p>Tools and equipment</p> <ul style="list-style-type: none"> • Personal protective equipment such as gloves, goggles and lab gowns • Beakers, conical bottles, volumetric flasks, wash bottles, glass rods, stopwatches, thermometers and other experimental consumables • Karl Fischer moisture meters (volumetric method, coulometry), Abbe refractometers, automatic refractometers, polarimeters, automatic polarimeters, solidification point testers, crystallization point testers, muffle furnaces, analytical balances, platform scales, petroleum product kinematic viscosity testers, petroleum product distillation range testers, open cup and closed cup flash point testers and other petroleum product analysis instruments <p>Materials</p> <ul style="list-style-type: none"> • Experimental reagents, sample delivery tables, and test reports <p>Requirements for employees</p> <ul style="list-style-type: none"> • Good manner, overall arrangement, teamwork spirit, integrity, and time management
	2.3 Determination of the refractive index of liquid samples.	
	2.4 Determination of the trace moisture in samples.	
	2.5 Determination of the distillation range of petroleum products.	
	2.6 Determination of the flash point of petroleum products.	
	2.7 Determination of the viscosity of petroleum products.	
3.0 Chemical analysis	3.1 Determination of constituent content by acid-base titration.	General skills and knowledge

DUTIES	TASKS	ENABLERS
	3.2 Determination of constituent content by coordination titration.	<ul style="list-style-type: none"> • Use of communication skills to communicate with others • Being able to understand simple chemical analysis testing method standards and operation specifications • Being able to read and understand simple schematic diagrams of testing devices • Being able to correctly select and use the inspection instruments and equipment related to the inspection category • Analytical chemistry • Operation and calibration of commonly-used quantitative analysis glass containers • Use and maintenance of electronic balances, dryers and muffle furnaces • Electrician knowledge • Computer operation • Laboratory organization and management <p>Tools and equipment</p> <ul style="list-style-type: none"> • Detection standards and technical requirements documents • Burettes, conical bottles, transfer pipets, funnels and other experimental consumables • Electronic balances, electric furnaces, filter device, dryers, muffle furnaces and other experimental instruments • Personal protective equipment such as protective gloves, goggles, work clothes • Calculators • Computers <p>Materials</p> <ul style="list-style-type: none"> • Original record tables • Detection samples • Laboratory water • Experimental reagents <p>Requirements for employees</p>
3.3 Determination of constituent content by coordination titration by oxidation-reduction titration.		
3.4 Determination of constituent content by precipitation titration.		
3.5 Determination of constituent content by gravimetry.		

DUTIES	TASKS	ENABLERS
		<p>Good manner, overall arrangement, teamwork spirit, integrity, meticulousness, carefulness and conscientiousness and being practical and realistic</p>
<p>4.0 Microbiological inspection</p>	<p>4.1 Configuration of the culture medium.</p>	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Use of communication skills to communicate with others • Knowledge about microorganisms • Knowledge about instruments use and maintenance • Knowledge about laboratory organization and management • Knowledge about occupational health and safety <p>Tools and equipment</p> <ul style="list-style-type: none"> • Personal protective equipment such as protective gloves, masks, goggles, work clothes • Autoclaves, constant temperature incubators, thermostat water baths, tray balances, balance, refrigerators, microscope, ultra-clean benches, and electric furnaces • Detection standards and technical requirements documents <p>Materials</p> <ul style="list-style-type: none"> • Original record tables • Various types of culture mediums or culture medium raw materials, and sterile water • Sterile petri dishes (diameter: 9cm), sterile straws, sterile glass spatulas, alcohol burners, alcohol cotton balls, sterile weighing dishes, glass slides, test tube racks, sterile plates, inoculation rings, inoculation needles, droppers, marker pens, label papers, small aluminum pots, 1000mL enamel cups with scale, horn spoons, glass rods, small beakers, pH test paper, funnels, funnel supports, cotton plugs, kraft paper, rubber rings, wire frames, 18*180mm test tubes, and 500mL triangular flasks
	<p>4.2 Inoculation and culture of microorganisms.</p>	
	<p>4.3 Detection of microorganisms.</p>	

DUTIES	TASKS	ENABLERS
		<ul style="list-style-type: none"> • Strains • Samples to be tested <p>Requirements for employees</p> <ul style="list-style-type: none"> • Communication skills, overall arrangement, teamwork spirit, integrity, time management, learning skills, written expression skills
5.0 Result reporting	5.1 Calculation of test results.	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Use of communication skills to communicate with others • Data operation rules • Rounding and operation of significant figure • Use of computer office software • Standardization of data table filling <p>Tools and equipment</p> <ul style="list-style-type: none"> • Calculators and computers <p>Materials</p> <ul style="list-style-type: none"> • Standard numerical values, original test record tables, data tables of test results, evaluation tables of test results, and report tables of test reports <p>Requirements for employees</p> <ul style="list-style-type: none"> • Meticulousness, good manner, overall arrangement, teamwork spirit, integrity, and time management
	5.2 Evaluation of test results.	
	5.3 Filling in test reports.	