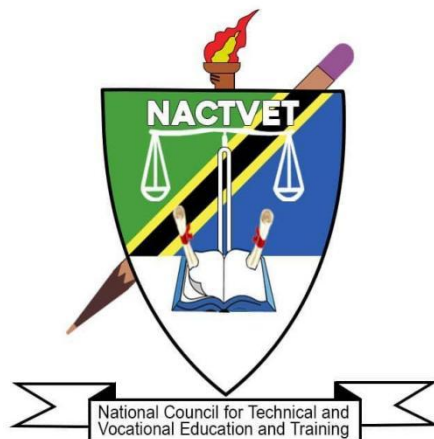


**NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND
TRAINING**



JANUARY 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: CHEMICAL TESTING TECHNICIAN

LEVEL: NTA 4

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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 a Chemical Testing Technician. 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. The Chemical Testing Technician 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 4

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SAMPLE COLLECTION AND PREPARATION	DUTY NO.	401
TASK TITLE	SAMPLE DELIVERY	TASK NO.	4011
PERFORMANCE CRITERIA	The person performing this task must be able to complete sample delivery, inspection, storage and registration in accordance with the sample types, inspection tasks and relevant regulations and standards.		
RANGE STATEMENT	<p>The task can be performed in the business acceptance 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. Samples; 2. Sample registration form; 3. Personal protective equipment such as protective gloves, goggles, work clothes, etc. 		
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. Perform sample delivery; 2. Fill in and sign the sample registration form; 3. Check the condition of the samples, verify the sealing methods, record and attach the sample labels; 4. Save samples. 		<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 Get relevant information about the detected items; 1.2 Describe the appearance, shapes and the quantity of the samples; 1.3 Fill in the information needed on the sample registration forms; 1.4 Perform sample preservation and safety protection. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <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 The specifications and requirements for civilized and polite using of the language; 3.2 The regulations for the delivery of samples in the laboratory; 3.3 The requirements of sample storage. <p>4.0 Essential Skills</p> <ol style="list-style-type: none"> 4.1 Communication skills; 4.2 Computer skills; 	

	<p>4.3 Customer service skills;</p> <p>4.4 Written expression skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Samples are registered, attached with sample identifications and stored 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 health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SAMPLE COLLECTION AND PREPARATION	DUTY NO.	401
TASK TITLE	SOLID SAMPLE COLLECTION	TASK NO.	4012
PERFORMANCE CRITERIA	The person performing this task must be able to complete the preparation of sampling tools, sample collection and storage, and safety protection.		
RANGE STATEMENT	<p>The task can be performed in the sampling site 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. Samples; 2. Sampling shovels; 3. Bucket; 4. Sampling bags and sampling bottles; 5. Sampling registration forms; 6. Personal protective equipment such as protective gloves, goggles, work clothes, etc. 		
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. Conduct sampling according to relevant regulations; 2. Record the sampling information and sign; 3. Analyse the properties and status of the samples and determine the distribution methods of sampling points; 4. Select the right sampling tools; 5. Determine the quantity and quality of samples. 		<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 Detect the relevant information of the project; 1.2 Determine the status of samples; 1.3 Select the sampling tools and containers, determine the quantity and quality of samples, and sampling distribution methods and the distribution methods of sampling points; 1.4 Fill in the information needed on the sample registration forms; 1.5 Perform sample preservation and safety protection. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <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 The calculation methods of the number and quality of subsamples; 3.2 The distribution methods of sampling points; 3.3 Sampling methods. 	

	<p>4.0 Essential Skills</p> <p>4.1 Computer skills;</p> <p>4.2 Written expression skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Customer service skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Samples are registered, attached with sample identifications and collected 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 health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SAMPLE COLLECTION AND PREPARATION	DUTY NO.	401
TASK TITLE	LIQUID SAMPLE COLLECTION	TASK NO.	4013
PERFORMANCE CRITERIA	The person performing this task must be able to complete the preparation of sampling tools, sample collection and storage, and safety protection.		
RANGE STATEMENT	<p>The task can be performed in the sampling site 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. Samples; 2. Sampling tubes and sampling bottles; 3. Sampling registration forms; 4. Personal protective equipment such as protective gloves, goggles, work clothes, etc. 		
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. Conduct sampling according to relevant regulations; 2. Record the sampling information and sign; 3. Determine the distribution methods of sampling points; 4. Select the right sampling tools; 5. Determine the quantity and quality of samples; 6. Save samples. 		<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 Detect the relevant information of the project; 1.2 Determine the status of samples; 1.3 Select the sampling tools and containers, determine the quantity and quality of samples, and sampling distribution methods and the distribution points of samples; 1.4 Fill in the information on sample registration forms; 1.5 Perform sample preservation and safety protection. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <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 The distribution methods of sampling points; 3.2 The methods of determining the quality and quantity of the samples; 3.3 The principles of sampler selection; 3.4 The principles of selecting sample preservation methods. 	

	<p>4.0 Essential Skills</p> <p>4.1 Computer skills;</p> <p>4.2 Written expression skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Customer service skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Sample registration forms are prepared, samples are attached with sample identifications and stored 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 health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SAMPLE COLLECTION AND PREPARATION	DUTY NO.	401
TASK TITLE	GAS SAMPLE COLLECTION	TASK NO.	4014
PERFORMANCE CRITERIA	The person performing this task must be able to complete the preparation of sampling tools, sample collection and storage, and safety protection.		
RANGE STATEMENT	<p>The task can be performed in the sampling site 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. Samples; 2. Sampling tubes, sampling bottles, absorption mediums and absorption apparatus; 3. Sampling registration forms; 4. Personal protective equipment such as protective gloves, goggles, work clothes, etc. 		
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. Conduct sampling according to relevant regulations; 2. Record the sampling information and sign; 3. Determine the sampling methods; 4. Select the right sampling tools; 5. Save samples. 		<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 Detect the relevant information of the project; 1.2 Determine the status of samples; 1.3 Select the sampling tools and containers, determine the quantity and quality of samples, and sampling distribution methods and the distribution points of samples; 1.4 Fill in the information needed on the sample registration forms; 1.5 Perform sample preservation and safety protection. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <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 The methods of determining subsample quantity; 3.2 The methods of determining subsample quality; 3.3 The requirements of sample distribution points; 3.4 The selection requirements for the methods of direct sampling and cluster sampling. 	

	<p>4.0 Essential Skills</p> <p>4.1 Computer skills;</p> <p>4.2 Written expression skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Customer service skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Samples are registered, attached with sample identifications and collected 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 health and safety

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SAMPLE COLLECTION AND PREPARATION	DUTY NO.	401
TASK TITLE	PREPARATION OF SOLID SAMPLES	TASK NO.	4015
PERFORMANCE CRITERIA	The person performing this task must be able to correctly prepare the solid samples whose compositions are uneven, including pulverizing, mixing and splitting.		
RANGE STATEMENT	<p>The task can be performed in the sample 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. Sample; 2. Pulverizing apparatus and grinding apparatus; 3. Sieving apparatus and splitting apparatus; 4. Sampling registration forms; 5. Personal protective equipment such as protective gloves, goggles, work clothes, etc. 		
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. Conduct sampling according to relevant regulations; 2. Record the sampling information and sign; 3. Conduct the air drying, pulverizing, sieving, mixing and splitting operations to the samples; 4. Save samples. 		<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 Detect the relevant information of the project; 1.2 Determine the status of samples; 1.3 Select the sampling tools and containers, determine the quantity and quality of samples, and sampling distribution methods and the distribution points of samples; 1.4 Conduct the air drying, pulverizing and sieving, and mixing and splitting operations to the solid samples; 1.5 Fill in the information needed on the sample registration forms; 1.6 Perform sample preservation and safety protection. <p>2.0 Principles</p> <p>The person performing this task must be able to explain the following principles:</p> <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 Principle and methods of sieving; 3.2 Principle and methods of splitting; 3.3 Principles of sample preservation. 	

	<p>4.0 Essential Skills</p> <p>4.1 Computer skills;</p> <p>4.2 Written expression skills;</p> <p>4.3 Communication skills;</p> <p>4.4 Customer service skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Samples are registered, attached with sample identifications and stored 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 health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SOLUTION PREPARATION	DUTY NO.	402
TASK TITLE	SUBSTANCE MASS WEIGHING	TASK NO.	4021
PERFORMANCE CRITERIA	The person performing this task must be able to weigh the substances according to the standard requirements of tasks inspection and relevant regulations.		
RANGE STATEMENT	<p>The task can be performed in the balance 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. Samples; 2. Weighing record tables; 3. Balances (tray balances and electronic balances); 4. Personal protective equipment such as protective gloves, goggles, work clothes, etc. 		
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. Separate samples; 2. Use balances; 3. Fill in the weighing record tables; 4. Carry out safety protection. 		<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 Weigh samples; 1.2 Fill in the weighing information record tables and sign. <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 Relevant regulations on weighing; 2.2 Operating rules of the balances. <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 Methods of identifying substances; 3.2 Relevant regulations on weighing samples; 3.3 Relevant requirements for data recording. <p>4.0 Essential Skills</p> <ol style="list-style-type: none"> 4.1 Communication skills; 4.2 Learning skills; 4.3 Written expression skills. 	
DESCRIPTION OF THE END PRODUCT / SERVICE		The sample weighing is completed and the weighing record tables are filled in according to the operation	

	specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Chemical operation safety; 2. Occupational health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SOLUTION PREPARATION	DUTY NO.	402
TASK TITLE	SOLUTION VOLUME MEASUREMENT	TASK NO.	4022
PERFORMANCE CRITERIA	The person performing this task must be able to measure the volume of the solution in accordance with the standard requirements of tasks inspection and relevant regulations.		
RANGE STATEMENT	<p>The task can be performed in 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. Liquid samples; 2. Measuring cylinders or measuring cups; 3. Transfer pipets or pipets; 4. Pipettors (not required); 5. Personal protective equipment such as protective gloves, goggles, work clothes, etc. 		
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. Separate samples; 2. Use measuring instruments (measuring cylinders, measuring cups, transfer pipets, pipets, etc.); 3. Use pipettors; 4. Fill in the record tables of solution measurement; 5. Carry out safety protection. 		<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 Measure the liquid samples; 1.2 Fill in the measurement data record tables and sign. <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 Relevant regulations on weighing; 2.2 Operating rules of the balances. <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 Relevant requirements for liquid samples; 3.2 Relevant regulations for liquid sample measurement; 3.3 Relevant requirements for data recording. <p>4.0 Essential Skills</p> <ol style="list-style-type: none"> 4.1 Communication skills; 4.2 Learning skills; 4.3 Written expression skills. 	

DESCRIPTION OF THE END PRODUCT / SERVICE	The volume of solutions is measured and the data record tables are filled in according to the operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: <ol style="list-style-type: none">1. Chemical operation safety;2. Occupational health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SOLUTION PREPARATION	DUTY NO.	402
TASK TITLE	GENERAL SOLUTION PREPARATION	TASK NO.	4023
PERFORMANCE CRITERIA	The person performing this task must be able to complete the task of preparing solutions in accordance with the standard requirements of tasks inspection and relevant regulations.		
RANGE STATEMENT	<p>The task can be performed in 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. Drugs for conducting the experiment (including water); 2. Balances (tray balances and electronic balances); 3. Commonly-used glass instruments in the laboratory (beakers, glass rods, measuring cylinders, volumetric flasks, reagent bottles, etc.); 4. Personal protective equipment such as protective gloves, goggles, work clothes, etc. 		
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 the water for general chemical analysis experiments; 2. Identify and select the commonly-used reagents required for solution preparation; 3. Use balances; 4. Use measuring tools such as measuring cylinders, measuring cups, transfer pipets, pipets, etc.; 5. Use beakers, volumetric flasks and other containers to prepare solutions; 6. Prepare test solutions (general solutions), buffer solutions, indicators and indicator solutions. 	<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 Select water for experiments; 1.2 Select drugs required for experiments; 1.3 Use balances; 1.4 Use measuring tools; 1.5 Carry out safety protection. <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 Relevant regulations for solution preparation; 2.2 Operating rules of the balances; 2.3 The principles of using water in the laboratory. <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 Relevant requirements for using water in the laboratory; 3.2 Relevant regulations on weighing samples; 3.3 Relevant requirements for data recording; 3.4 Regulations for correctly using measuring tools. 		

	4.0 Essential Skills 4.1 Communication skills; 4.2 Learning skills; 4.3 Written expression skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Liquids are prepared and labelled according to operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Chemical operation safety; 2. Occupational health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	SOLUTION PREPARATION	DUTY NO.	402
TASK TITLE	STANDARD SOLUTION PREPARATION	TASK NO.	4024
PERFORMANCE CRITERIA	The person performing this task must be able to complete the task of preparing solutions in accordance with the standard requirements of tasks inspection and relevant regulations.		
RANGE STATEMENT	<p>The task can be performed in 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. Drugs for conducting the experiment (including water); 2. Balances (tray balances and electronic balances); 3. Commonly-used glass instruments in the laboratory (beakers, glass rods, measuring cylinders, volumetric flasks, reagent bottles, etc.); 4. Personal protective equipment such as protective gloves, goggles, work clothes, etc. 		
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 the water for general chemical analysis experiments; 2. Identify and select the commonly-used reagents required for solution preparation; 3. Use balances; 4. Use measuring tools such as measuring cylinders, measuring cups, transfer pipets, pipets, etc.; 5. Use beakers, volumetric flasks and other containers to prepare solutions; 6. Prepare standard solutions. 		<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 Select water for experiments; 1.2 Select drugs required for experiments; 1.3 Use balances; 1.4 Use measuring tools; 1.5 Carry out safety protection. <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 Relevant requirements for preparing standard solutions; 2.2 Operating rules of the balances; 2.3 The principles of using water in the laboratory. <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 Relevant requirements for using water in the laboratory; 3.2 Criteria for the classification of drug grades; 3.3 Requirements for standard substances and standard solutions; 3.4 Relevant regulations on weighing samples; 	

	<p>3.5 Relevant requirements for data recording; 3.6 Regulations for correctly using measuring tools.</p> <p>4.0 Essential Skills 4.1 Communication skills; 4.2 Learning skills; 4.3 Written expression skills; 4.4 Reading skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Standard solutions are prepared according to operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	<p>Detailed knowledge about:</p> <ol style="list-style-type: none"> 1. Chemical safety operation; 2. Occupational health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTRUMENTS AND EQUIPMENT PREPARATION	DUTY NO.	403
TASK TITLE	AUXILIARY EQUIPMENT PREPARATION	TASK NO.	4031
PERFORMANCE CRITERIA	The person performing this task must be able to correctly identify and select glass instruments according to the preparation requirement of instruments and equipment; correctly select the washing liquid, wash and dry the commonly-used glass instruments, etc. according to the prescribed operating procedures; correctly use inspection auxiliary equipment such as electric furnaces, drying ovens, muffle furnaces (high temperature furnaces), water heaters, centrifuges, vacuum pumps, and electric oscillators.		
RANGE STATEMENT	The task can be performed in the pretreatment room under the supervision of senior technicians or chemical testing engineers. The tools and equipment to be used include: 1. Glass instruments; 2. Washing and inspection of drying and tightness of glass instruments; 3. Correct use of glass instruments; 4. Correct use of inspection auxiliary equipment.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
The person performing this task must be able to do the following: 1. Identify and select glass instruments and other supplies; 2. Select the washing liquid, wash and dry the commonly-used glass instruments according to the prescribed operating procedures; 3. Perform basic operations such as cutting and bending the glass rods and tubes; 4. Perform the equipped drill holes of rubber plugs, install simple test apparatus as shown in the schematics and be able to check the air tightness of the apparatus; 5. Select glass measuring instruments (including basic glass measuring instruments, such as burets, transfer pipets, volumetric flasks, and special glass measuring instruments such as moisture meters) and be able to check the tightness (leakage test), correctly grease acid burets and drive out air bubbles from	Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Identify the names and purposes of commonly-used glass instruments and other supplies; 1.2 Wash glass instruments; 1.3 Operate glass instruments; 1.4 Select and use rubber plugs, rubber hoses and latex tubes with different specifications; 1.5 Use perforators; 1.6 Check the air tightness of apparatus; 1.7 Use auxiliary equipment in the laboratory; 1.8 Carry out safety protection. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Using methods of laboratory glass instruments; 2.2 Relevant regulations of using auxiliary equipment. 3.0 Theories		

<p>alkaline burets;</p> <p>6. Use inspection auxiliary equipment such as electric furnaces, drying ovens, muffle furnaces (high temperature furnaces), water heaters, centrifuges, vacuum pumps, and electric oscillators.</p>	<p>The person performing this task must be able to explain the following:</p> <p>3.1 Names, specifications and usage of glass measuring instruments;</p> <p>3.2 Methods of washing glass instruments;</p> <p>3.3 The safety operation of auxiliary equipment such as electric furnaces, drying ovens, muffle furnaces (high temperature furnaces), water heaters, centrifuges, vacuum pumps, and electric oscillators.</p> <p>4.0 Essential Skills</p> <p>4.1 Communication skills;</p> <p>4.2 Learning skills;</p> <p>4.3 Written expression skills.</p>
<p>DESCRIPTION OF THE END PRODUCT / SERVICE</p>	<p>Glass instruments are selected, washed, and used in accordance with the operation specifications and requirements.</p>
<p>CIRCUMSTANTIAL KNOWLEDGE</p>	<p>Detailed knowledge about:</p> <p>1. Chemical safety operation;</p> <p>2. Occupational health and safety.</p>

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTRUMENTS AND EQUIPMENT PREPARATION	DUTY NO.	403
TASK TITLE	MEASURING INSTRUMENTS PREPARATION	TASK NO.	4032
PERFORMANCE CRITERIA	The person performing this task must be able to correctly use balances (including analytical balances and tray balances), pH meters (the magnetic stirrers are attached), standard sieves, stopwatches, thermometers and other measuring instruments.		
RANGE STATEMENT	The task can be performed in the former office, balance room, and instrumental analysis laboratory under the supervision of senior technicians or chemical testing engineers. The tools and equipment to be used include: 1. Analytical balances and tray balances; 2. pH meters (the magnetic stirrers are attached); 3. Measuring instruments such as standard sieves, stopwatches, thermometers and so on.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
The person performing this task must be able to do the following: 1. Use balances (including analytical balances and tray balances); 2. Use pH meters (the magnetic stirrers are attached); 3. Use measuring instruments such as standard sieves, stopwatches, thermometers and so on.	<p>Detailed knowledge about:</p> <p>1.0 Methods The person performing this task must be able to explain how to: 1.1 Operate balances (including analytical balances and tray balances); 1.2 Operate pH meters (the magnetic stirrers are attached); 1.3 Operate measuring instruments such as standard sieves, stopwatches, thermometers and so on.</p> <p>2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The structure of balances and pH meters and other measuring instruments; 2.2 Metering performance and usage rules.</p> <p>3.0 Theories The person performing this task must be able to explain the following: 3.1 Specifications for the use of laboratory measuring instruments.</p> <p>4.0 Essential Skills 4.1 Communication skills;</p>		

	4.2 Written expression skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Laboratory measuring instruments (balances, pH meters, standard sieves, stopwatches, thermometers, etc.) are prepared and used 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	INSTRUMENTS AND EQUIPMENT PREPARATION	DUTY NO.	403
TASK TITLE	GENERAL AND SPECIAL INSPECTION INSTRUMENTS AND EQUIPMENT PREPARATION	TASK NO.	4033
PERFORMANCE CRITERIA	The person performing this task must be able to correctly use general and special inspection instruments and equipment related to this test category.		
RANGE STATEMENT	<p>The task can be performed in the instrumental analysis laboratory 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. General and special inspection instruments and equipment in the microorganism laboratory: superstatic workbenches, homogenizers, incubators, autoclaves, microscopes, refrigerators; 2. Special-purpose equipment in the coating laboratory: scraper fineness meters, coating 1 and coating 4 viscometers, glass plates with black and white grids, drying testers; 3. Densitometers, rapid ash determination instrument. 		
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 general and special inspection instruments and equipment in the microorganism laboratory: superstatic workbenches, homogenizers, incubators, autoclaves, microscopes, refrigerators; 2. Use special-purpose equipment in the coating laboratory: scraper fineness meters, coating 1 and coating 4 viscometers, glass plates with black and white grids, drying testers; 3. Use densitometers and rapid ash determination instrument. 	<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 Use superstatic workbenches, homogenizers, incubators, autoclaves, microscopes, refrigerators; 1.2 Use scraper fineness meters, coating 1 and coating 4 viscometers, glass plates with black and white grids, drying testers; 1.3 Use densitometers and rapid ash determination instrument. <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 Rules for using laboratory general and special inspection instruments. <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 Specifications for using laboratory general and special inspection instruments. <p>4.0 Essential Skills</p>		

	<p>4.1 Communication skills;</p> <p>4.2 Written expression skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	Laboratory general and special inspection instruments are prepared and used according to the 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	INSTRUMENTS AND EQUIPMENT PREPARATION	DUTY NO.	403
TASK TITLE	CAPACITY CALIBRATION OF THE GLASS MEASURING INSTRUMENTS	TASK NO.	4034
PERFORMANCE CRITERIA	The person performing this task must be able to correct the glass instruments (such as burets, volumetric flasks, transfer pipets, graduated pipets and graduated volumetric flasks, etc.)		
RANGE STATEMENT	<p>The task can be performed in the balance 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. Burets (acid burets and alkaline burets); 2. Volumetric flasks; 3. Transfer pipets (graduated pipets); 4. Electronic balances. 		
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. Calibrate burets (acid burets and alkaline burets); 2. Calibrate volumetric flasks; 3. Calibrate transfer pipets (graduated pipets). 		<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 Wash burets, volumetric flasks and transfer pipets; 1.2 Calibrate burets' (acid burets and alkaline burets) volume; 1.3 Calibrate the volumetric flasks' volume; 1.4 Calibrate the transfer pipets' (graduated pipets) volume. <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 Capacity calibration requirements for laboratory glass measuring instruments. <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 Operating methods for the capacity calibration of laboratory glass measuring instruments. <p>4.0 Essential Skills</p> <ol style="list-style-type: none"> 4.1 Communication skills; 4.2 Computing skills; 4.3 Written expression skills. 	

DESCRIPTION OF THE END PRODUCT / SERVICE	Laboratory glass measuring instruments are calibrated and the curve reports are prepared and calibrated according to operation specifications and requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: <ol style="list-style-type: none">1. Chemical operation specifications;2. Occupational health and safety.

OCCUPATION	CHEMICAL TESTING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTRUMENTS AND EQUIPMENT PREPARATION	DUTY NO.	403
TASK TITLE	MAINTENANCE OF ELECTRONIC BALANCES	TASK NO.	4035
PERFORMANCE CRITERIA	The person performing this task must be able to correctly maintain electronic balances and gain proficiency in the specifications of using electronic balances at the same time.		
RANGE STATEMENT	<p>The task can be performed in the balance 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. Electronic balances; 2. The operation instructions of the electronic balance specifications. 		
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. Check the performance of balances; 2. Calibrate electronic balances; 3. Maintain electronic balances. 	<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 performance of electronic balances; 1.2 Calibrate electronic balances; 1.3 Maintain electronic balances. <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 The using specifications of electronic balances. <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 The operation methods of electronic balances; 3.2 The maintenance methods of electronic balances. <p>4.0 Essential Skills</p> <ol style="list-style-type: none"> 4.1 Communication skills; 4.2 Learning skills; 4.3 Written expression skills. 		
DESCRIPTION OF THE END PRODUCT / SERVICE	Electronic balances are used and maintained according to the 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	DETECTION OF BASIC PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	404
TASK TITLE	SOLUTION PH VALUE MEASUREMENT	TASK NO.	4041
PERFORMANCE CRITERIA	The person performing this task must be able to complete the preparation of the solution to be tested and the determination of the pH value of the solution using pH test paper in accordance with the types of samples and the using rules and requirements of pH test papers.		
RANGE STATEMENT	<p>The task can be performed in the electrochemical 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. Samples; 2. PH test papers; 3. Beakers; 4. Glass rods; 5. Personal protective equipment such as 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. Conduct solution preparation; 2. Select pH test papers; 3. Find and identify problems and give recommendations for handling them; 4. Write reports; 5. Do a good job of operation safety protection and experimental waste disposal. 		<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 Prepare the sample solutions to be tested; 1.2 Select the types of pH test papers; 1.3 Determine the pH value of the samples; 1.4 Fill in the relevant information on the original record tables of sample determination. <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 The requirement of using pH test papers. <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 The relationship between pH and the pH value of solutions; 3.2 The methods of using pH test papers; 3.3 The preparation of solutions to be tested; 3.4 The determination methods of pH value. <p>4.0 Essential Skills</p>	

	<p>4.1 Literature review skill;</p> <p>4.2 Manual operation skills;</p> <p>4.3 Written expression skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The pH value of solutions is determined according to 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	DETECTION OF BASIC PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	404
TASK TITLE	LIQUID SAMPLE DENSITY DETERMINATION	TASK NO.	4042
PERFORMANCE CRITERIA	The person performing this task must be able to complete the liquid sample density determination according to the characteristics of the liquid samples and the rules and requirements of using densitometers.		
RANGE STATEMENT	<p>The task can be performed in the physical constant 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. Samples; 2. Densitometers; 3. Densitometer barrels; 4. Thermometers; 5. Constant temperature bath; 6. Glass or plastic stirring rods; 7. Personal protective equipment such as 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. Collect liquid samples; 2. Select densitometers; 3. Find and identify problems and give recommendations for handling them; 4. Write reports; 5. Do a good job of operation safety protection and experimental waste disposal. 		<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 Collect liquid samples; 1.2 Control test temperature; 1.3 Select densitometers; 1.4 Determine the sample density; 1.5 Fill in the relevant information on the original record tables of sample determination. <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 Methods for determining the density of liquid samples; 2.2 The requirements of using densitometers; 2.3 The requirements of technical management for instruments. <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 Basic requirements for density determination; 	

	<p>3.2 Structure and characteristics of densitometers; 3.3 Operation methods of densitometers; 3.4 Methods of determining density.</p> <p>4.0 Essential Skills 4.1 Literature review skill; 4.2 Manual operation skills; 4.3 Written expression skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The density is determined and the density inspection report form is prepared according to the 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	DETECTION OF BASIC PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	404
TASK TITLE	DETERMINATION OF THE BOILING POINTS AND BOILING RANGES OF LIQUID SAMPLES	TASK NO.	4043
PERFORMANCE CRITERIA	The person performing this task must be able to complete the determination of the boiling points and boiling ranges of liquid samples according to the characteristics of the liquid samples and specifications for the use of boiling point measuring apparatus and distillation apparatus.		
RANGE STATEMENT	<p>The task can be performed in the physical constant 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. Samples; 2. Barometers, thermometers, electric mantles, alcohol burners; 3. Complete distillation apparatus, boiling point measuring tubes; 4. Three-neck round bottom flasks, test tubes, rubber stoppers, rubber bands, capillary tubes; 5. Personal protective equipment such as 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. Collect liquid samples; 2. Install distillation apparatus; 3. Select experimental apparatus; 4. Observe the distillation speed and key phenomena; 5. Find and identify problems and give recommendations for handling them; 6. Write reports; 7. Conduct safety protection and experimental waste disposal. 	<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 Collect liquid samples; 1.2 Record the experimental temperature and pressure; 1.3 Select experimental apparatus; 1.4 Determine the boiling point of samples; 1.5 Determine the boiling range of samples; 1.6 Fill in the relevant information on the original record tables of sample determination. <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 The methods of determining the boiling points and boiling ranges; 2.2 The requirements of using the distillation apparatus; 2.3 The requirements of technical management for instruments. <p>3.0 Theories</p> <p>The person performing this task must be able to</p>		

	<p>explain the following:</p> <p>3.1 Basic methods for determining boiling points and boiling ranges;</p> <p>3.2 Structure and characteristics of three-neck round bottom flasks;</p> <p>3.3 Components of distillation apparatus;</p> <p>3.4 Methods of determining boiling points;</p> <p>3.5 Methods of determining boiling ranges.</p> <p>4.0 Essential Skills</p> <p>4.1 Literature review skill;</p> <p>4.2 Manual operation skills;</p> <p>4.3 Written expression skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The boiling points of the samples are determined according to the operation specifications and requirements and the boiling point inspection report forms and boiling range inspection report forms are written.
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	DETECTION OF BASIC PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	404
TASK TITLE	DETERMINATION OF MELTING POINTS OF SOLID SAMPLES	TASK NO.	4044
PERFORMANCE CRITERIA	The person performing this task must be able to complete the liquid sample density determination according to the characteristics of solid samples and the rules and requirements of using melting point measuring tubes.		
RANGE STATEMENT	<p>The task can be performed in the physical detection 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. Samples; 2. Melting point measuring tubes; 3. Iron support stands; 4. Thermometers; 5. Capillary tubes; 6. Alcohol burners; 7. Personal protective equipment such as 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. Close the end of capillary tubes; 2. Fill the solid samples; 3. Install melting point measuring apparatus; 4. Observe the end point phenomena of samples; 5. Determine the melting point of samples; 6. Find and identify problems and give recommendations for handling them; 7. Write reports; 8. Conduct safety protection and experimental waste disposal. 		<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 Close the capillary tubes; 1.2 Fill the solid samples; 1.3 Install melting point measuring apparatus; 1.4 Determine the melting point of samples; 1.5 Fill in the relevant information on the original record tables of sample determination. <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 Methods of determining melting points; 2.2 Requirements of using measuring tubes for melting points; 2.3 The requirements of technical management for instruments. <p>3.0 Theories</p> <p>The person performing this task must be able to explain the following:</p>	

	<p>3.1 Basic methods of determining melting points;</p> <p>3.2 Structure and characteristics of melting point measuring tubes;</p> <p>3.3 Installation methods of apparatus for determining melting points;</p> <p>3.4 Methods of determining melting point.</p> <p>4.0 Essential Skills</p> <p>4.1 Literature review skill;</p> <p>4.2 Manual operation skills;</p> <p>4.3 Written expression skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The melting points of the samples are determined and the melting point inspection report forms are written according to the 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	DETECTION OF BASIC PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	404
TASK TITLE	DETERMINATION OF EVAPORATION RESIDUE IN LIQUID SAMPLES	TASK NO.	4045
PERFORMANCE CRITERIA	The person performing this task must be able to complete the determination of the evaporation residue of liquid samples according to the difference of volatilization properties between liquid samples and residue of liquid samples and the rules and requirements of using evaporation containers.		
RANGE STATEMENT	<p>The task can be performed in the physical detection 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. Samples; 2. Analytical balances; 3. Evaporating dishes, crucibles or beakers; 4. Tripods; 5. Constant temperature water bath; 6. Electrothermal constant-temperature drying ovens; 7. Personal protective equipment such as 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. Analyse the properties of the liquid samples and select suitable evaporation containers; 2. Weigh liquid samples; 3. Evaporate liquid samples; 4. Dry and keep constant weight of residue; 5. Find and identify problems and give recommendations for handling them; 6. Write reports; 7. Conduct safety protection and experimental waste disposal. 	<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 Analyse the properties of the liquid samples and select suitable evaporation containers; 1.2 Weigh liquid samples; 1.3 Evaporate liquid samples; 1.4 Dry and keep constant weight of residue; 1.5 Fill in the relevant information on the original record tables of sample determination. <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 Methods for determining the evaporation residue; 2.2 The requirements of technical management for instruments. <p>3.0 Theories</p> <p>The person performing this task must be able to</p>		

	<p>explain the following:</p> <p>3.1 Basic methods for determining evaporation residue;</p> <p>3.2 Selection requirements of different evaporation containers;</p> <p>3.3 Methods for determining the evaporation residue;</p> <p>3.4 Calculation methods of evaporation residue.</p> <p>4.0 Essential Skills</p> <p>4.1 Literature review skill;</p> <p>4.2 Manual operation skills;</p> <p>4.3 Written expression skills.</p> <p>5.0 Math Skills</p> <p>5.1 Numerical computation.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The evaporation residue of samples is determined and the inspection report forms of evaporation residue are written according to the 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	DETECTION OF BASIC PHYSICAL PARAMETERS AND PERFORMANCE	DUTY NO.	404
TASK TITLE	DETERMINATION OF WATER INSOLUBLE MATTER IN SOLID SAMPLES	TASK NO.	4046
PERFORMANCE CRITERIA	The person performing this task must be able to complete the determination of the evaporation residue of liquid samples according to the difference of volatilization properties between liquid samples and residue of liquid samples and the rules and requirements of using evaporation containers.		
RANGE STATEMENT	<p>The task can be performed in the physical detection 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. Samples; 2. Analytical balances; 3. General laboratory instruments; 4. Glass filter crucibles; 5. Electrothermal constant-temperature drying ovens; 6. Personal protective equipment such as 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. Keep the glass filter crucibles at a constant weight; 2. Weigh the solid samples; 3. Dissolve and cool the solid samples; 4. Dry and keep a constant weight of water insoluble matters; 5. Find and identify problems and give recommendations for handling them; 6. Write reports; 7. Conduct safety protection and experimental waste disposal. 	<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 Keep the glass filter crucibles at a constant weight; 1.2 Weigh the solid samples; 1.3 Dissolve and cool the solid samples; 1.4 Dry and keep a constant weight of water insoluble matters; 1.5 Fill in the relevant information on the original record tables of sample determination. <p>2.0 Principles</p> <ol style="list-style-type: none"> 2.1 The methods for determining water insoluble matters; 2.2 The requirements of technical management for instruments. <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 The basic methods for determining water insoluble matters; 		

	<p>3.2 The methods for determining water insoluble matters; 3.3 The calculation methods of water insoluble matters.</p> <p>4.0 Essential Skills 4.1 Literature review skill; 4.2 Manual operation skills; 4.3 Written expression skills.</p>
DESCRIPTION OF THE END PRODUCT / SERVICE	The solid samples of water insoluble matters are determined and inspection report forms of water insoluble matters are written according to 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	DATA RECORDING	DUTY NO.	405
TASK TITLE	RECORDING AND PRESENTATION OF TESTING DATA	TASK NO.	4051
PERFORMANCE CRITERIA	The person performing this task must be able to complete the task of recording and presenting testing data according to the standard requirements of tasks inspection and relevant regulations.		
RANGE STATEMENT	<p>The task can be performed in each laboratory 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. Calculators; 2. Data record tables; 3. Personal protective equipment such as protective gloves, goggles, work clothes, etc. 4. Computers (not essential). 		
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. Record the original test data and fill in the test record tables; 2. Validate the number of digits, and perform data modification and calculation; 3. Visualize experimental data. 		<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 Record the original test data; 1.2 Fill in the test record tables; 1.3 Perform data modification and calculation; 1.4 Present experimental data. <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 Requirements of original record filling; 2.2 Rules of data modification and calculation. <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 Requirements of original data recording; 3.2 Requirements for significant figures and rounding-off for numerical values. <p>4.0 Essential Skills</p> <ol style="list-style-type: none"> 4.1 Data recording skills; 4.2 Written expression skills. 	
DESCRIPTION OF THE END		Data record tables.	

PRODUCT / SERVICE	
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: <ol style="list-style-type: none">1. Chemical operation safety;2. Occupational health and safety.

TABLE 1: DACUM CHARTS FOR CHEMICAL TESTING TECHNICIAN - NTA 4

DUTIES	TASKS	ENABLERS
1.0 Sample collection and preparation	1.1 Sample delivery.	<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 • Basic chemistry • Selection principles of sampling instruments and equipment • Selection principles of sampling containers • Methods of sampling and distribution • Methods of determining the quantity and quality of the samples • Determining ways of sample status • Storage methods of samples • The operating methods of the air drying, pulverizing, sieving, mixing and splitting samples <p>Tools and equipment</p> <ul style="list-style-type: none"> • Personal protective equipment such as gloves, goggles and lab gowns, etc. • Sampling shovels, buckets, sampling bags, sampling bottles • Sampling tubes, sampling bags, absorption apparatus • Pulverizing apparatus, grinding apparatus • Sieving apparatus, splitting apparatus <p>Materials</p> <ul style="list-style-type: none"> • Samples, sample registration tables, sample protection equipment and reagents, mediums for gas sample absorption <p>Requirements for employees</p> <ul style="list-style-type: none"> • Good manner, overall arrangement, teamwork spirit, integrity, time management, communication, computing skills, written expression ability, safety
	1.2 Solid sample collection.	
	1.3 Liquid sample collection.	
	1.4 Gas sample collection.	
	1.5 Preparation of solid samples.	

DUTIES	TASKS	ENABLERS
		and health awareness
2.0 Solution preparation	2.1 Substance mass weighing. 2.2 Solution volume measurement. 2.3 General solution preparation. 2.4 Standard solution preparation.	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Literature review skill • Manual operation skills • Skills of observing and analysing experimental phenomena • Written expression skills • Skills of laboratory accident prevention and management • Knowledge of solution preparation • Specifications for the use of measuring instruments <p>Tools and equipment</p> <ul style="list-style-type: none"> • Personal protective equipment such as gloves, goggles and lab gowns, etc. • Glass instruments in general laboratory • Glass measuring instruments (burets, volumetric flasks, transfer pipets, graduated pipets) • Analytical balances <p>Materials</p> <ul style="list-style-type: none"> • Original data record tables, relevant standards of solution preparation <p>Requirements for employees</p> <ul style="list-style-type: none"> • Good manner, overall arrangement, teamwork spirit, integrity, standardized operation, be practical and realistic, scientific spirit and rigor
3.0 Instruments and equipment preparation	3.1 Auxiliary equipment preparation. 3.2 Measuring instruments preparation. 3.3 Preparation of general and special inspection instruments and equipment. 3.4 Capacity calibration of the glass measuring	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Use of communication skills to communicate with others • Preparation of auxiliary equipment, measuring instruments and apparatus and glass measuring instruments, and the structure, metering performance and usage regulations of electronic balances. • The preparation of the operation

DUTIES	TASKS	ENABLERS
	instruments. 3.5 Maintenance of electronic balances.	specifications of instruments and equipment <ul style="list-style-type: none"> • Specifications for the calibration of measuring instruments • Maintenance and calibration of electronic balances <p>Tools and equipment</p> <ul style="list-style-type: none"> • Experimental auxiliary equipment • Experimental measuring instruments • General and special inspection instruments • Glass measuring instruments (burets, volumetric flasks, transfer pipets, graduated pipets) • Electronic balances <p>Materials</p> <ul style="list-style-type: none"> • Preparation of auxiliary equipment, measuring instruments and apparatus and glass measuring instruments, and the operation specifications and calibration procedures of electronic balances. <p>Requirements for employees</p> <ul style="list-style-type: none"> • Good manner, overall arrangement of time, standard operations of experimental instruments and equipment
4.0 Detection of basic physical parameters and performance	4.1 Solution pH value measurement. 4.2 Liquid sample density determination. 4.3 Determination of the boiling points and boiling ranges of liquid samples. 4.4 Determination of melting points of solid samples. 4.5 Determination of evaporation residue in liquid samples. 4.6 Determination of water insoluble matter in solid samples.	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Literature review skill • Manual operation skills • Skills of observing and analysing experimental phenomena • Written expression skills • Skills of laboratory accident prevention and management • Skills of basic physical parameters and performance detection <p>Tools and equipment</p> <ul style="list-style-type: none"> • Personal protective equipment such as gloves, goggles and lab gowns, etc.

DUTIES	TASKS	ENABLERS
		<ul style="list-style-type: none"> • Glass instruments in general laboratory • Analytical balances • Constant temperature drying ovens <p>Materials</p> <ul style="list-style-type: none"> • Original data record tables <p>Requirements for employees</p> <ul style="list-style-type: none"> • Good manner, overall arrangement, teamwork spirit, integrity, time management, be practical and realistic, scientific spirit and rigor
5.0 Data recording	5.1 Recording and presentation of testing data.	<p>General skills and knowledge</p> <ul style="list-style-type: none"> • Skills of observing and analysing experimental phenomena • Written expression skills • Simple calculation skills <p>Tools and equipment</p> <ul style="list-style-type: none"> • Calculators • Recording pens <p>Materials</p> <ul style="list-style-type: none"> • Original data record tables <p>Requirements for employees</p> <ul style="list-style-type: none"> • Good manner, be practical and realistic, scientific spirit and rigor