



Soil, Water and Fertilizer Testing Lab Technician

National Vocational Qualification level – 5

“Soil, Water and Fertilizer Testing Lab Technician”



(Curriculum)

**National Vocational and Technical Training Commission (NAVTTTC)
Government of Pakistan**



Soil, Water and Fertilizer Testing Lab Technician



Table of Contents

• Introduction.....	5
• Purpose of the training program:	5
• Overall objectives of training program:.....	7
• Competencies to be gained after completion of course:	8
• Entry level of trainees:	9
• Minimum qualification of trainer/instructor:.....	9
• Recommended trainer: trainee ratio	9
• Medium of instruction i.e. language of instruction:	9
• Duration of the course (Total time, Theory & Practical time):	10
• Description and structure of the course	11
Module 1: Handling of sophisticated level Equipment 2	14
Module 2: Perform Ammonical Nitrogen In Solid, Liquid and Mixed Fertilizer By Kjeldahl Method	19
Module 3: Perform Nitrate-N In solid, liquid and mixed fertilizer by Kjeldahl method	23
Module 4: Perform Uric/Urease Nitrogen (N) In Solid, Liquid And Mixed Fertilizer By Kjeldahl Method	27
Module 5: Perform Potassium (K) in Solid, Liquid and Mixed Fertilizer by Flame Photometry Method	32



Soil, Water and Fertilizer Testing Lab Technician



Module 6: Perform water soluble micronutrients (Zn, Fe, Mn etc) in Fertilizers through Atomic Absorption Spectrometer (AAS) Method.....	36
Module 7: Perform Soil Micronutrient Test	40
Module 8: Perform Standard Test Method (STM) for Zinc chelated percentage.....	44
Module 9: Perform Standard Test Method (STM) to evaluate Gypsum Requirement in soil	48
Module 10: Generate test report	51
Module 11: Ensure Test Quality	54
Module 1: Develop Entrepreneurial Skills	57
Module 2: Maintain Business Resources.....	60
Module 3: Develop A Sales Plan	63
Module 4: Plan And Implement Business-To-Business Marketing.....	67
Module 5: Address Customer Needs	71
Module 6: Solve Problems Which Jeopardize Safety And Security	76
Module 7: Apply problem solving techniques in the workplace using critical thinking	82
Module 8: Manage Personal Finances.....	85
Module 9: Coordinate a Work Team	89
Module 10: Lead Small Teams	94
Module 11: Manage Human Resource Services	99
• List of Tool & Equipment:.....	104
11. Members of the Curriculum Development Committee	109
12. Members of the Qualification Validation Committee	110



Soil, Water and Fertilizer Testing Lab Technician





Soil, Water and Fertilizer Testing Lab Technician



- **Introduction**

The Technical and Vocational is a profession that is increasingly getting attention in Pakistan, not only among the youth seeking to enter the industry but also among adults who wish to polish their skills to develop a career out of it.

Soil and water are essential natural resources for our domesticated food production systems. Fertilizers are used to supplement soil nutrient stocks with minerals that can be easily absorbed and used by crops. Without fertilizers, agricultural production would be significantly reduced. Soil, water and fertilizer are intertwined in agriculture and are closely related to agricultural production and food security. Soil is a vital part of successful agriculture and a key source of crop nutrients. Irrigation water dissolves nutrients and other substances, transporting them from soil to plant. Irrigation water helps successful crop cultivation. Water scarcity along with quality limits crop production and can dramatically affect the survival of humans and living organisms on this planet.

In fact, no sphere in agriculture can be identified without the contribution of soil, water and fertilizer. The important knowledge regarding soil, water and fertilizer quality through the latest analysis protocols makes this diploma very valuable not only in agriculture but also enhance its usefulness in all areas of our daily life. Market demand for qualified workers in this qualification is a need of time and is very crucial for sustainable development of agriculture sector. This demand can only be addressed by developing specific skills standards in partnership with all stakeholders and industry experts. Recognizing this fact, the National Vocational and Technical Training Commission (NAVTTTC) has developed the National Vocational Qualifications Framework (NVQF) for Soil, Water and Fertilizer Testing Lab Technician qualifications. These competency standards have been developed by the Qualifications Development Committee (QDC) and validated by the Qualifications Validation Committee (QVC) with representation from the country's leading departments (Soil Fertility Research Institute Punjab, UVAS, PCSIR, FMC and Cereal Crops Research Institute, Pirsabak Nowshera).

- **Purpose of the training program:**

The qualifications mainly cover competencies along with related knowledge and professional attitude which is essential for getting a job or self-employed.



Soil, Water and Fertilizer Testing Lab Technician



The qualifications are also in line with the vision of Pakistan's National Skills Strategy (NSS), National TVET Policy and National Vocational Qualification Framework (NVQF). This provides policy directions, support and an enabling environment to the public and private sectors to impart training for skills development to enhance social and economic profile. The National Vocational & Technical Training Commission (NAVTTTC) has approved the Qualification Development Committee (QDC) for Soil, Water and Fertilizer Testing Lab Technician. The QDC consists of experts from the relevant industries from different geographical locations across Pakistan and academicians who were consulted during the development process to ensure input and ownership of all the stakeholders. The National Competency Standards could be used as a referral document for the development of curricula to be used by training institutions.

The purpose of the training is to provide skilled manpower to improve the quality of value-added products of industrial sector. This training will provide the basic skills to the trainees in the field of Agriculture and convert it into value added product which is acceptable by International market reducing the line losses and fit-in a skilled graduate into National Vocational Qualification Framework for his / her vertical career progression and qualification equivalencies at par with acceptable international standards.

Furthermore, the aim of this qualifications is to set high and applicable professional standards for all stake holders in agriculture sector. The basic goals of establishing these credentials are as follows:

1. Equip with the latest knowledge and skill regarding soil, water and fertilizer.
2. Assess soil fertility, water and fertilizer quality using appropriate laboratory techniques.
3. Macro and micronutrient status assessment and survey of farmers' fields
4. Improve trainees' professional competence
5. Provide opportunities for recognition of non-formal or informal skills
6. Raise standard and efficacy of scientific training and assessment
7. Improve crop production through soil, water and fertilizer test results
8. Application of site-specific fertilizers as needed by the crop contributes to lower costs and environmental impacts



Soil, Water and Fertilizer Testing Lab Technician



9. Enable existing workforce to learn new technologies and methods
10. Enable the skilled person of this qualification to validate test method attributes

- **Overall objectives of training program:**

The main objectives of the **Soil, Water and Fertilizer Testing Lab Technician** (Level-5) are as follows:

1. Handling of sophisticated level Equipment 2
2. Perform Ammonical Nitrogen In Solid, Liquid and Mixed Fertilizer By Kjeldahl Method
3. Nitrate-N In solid, liquid and mixed fertilizer by kjeldahl method
4. Perform Uric/Urease nitrogen (n) in solid, liquid and mixed fertilizer by Kjeldahl method
5. Perform Potassium (K) in Solid, Liquid and Mixed Fertilizer by Flame Photometry Method
6. Perform water soluble micronutrients (Zn, Fe, Mn etc) in Fertilizers through AAS Method
7. Perform Soil Micronutrient Test
8. Perform Standard Test Method (STM) for Zinc chelated percentage
9. Generate test report
10. Ensure Test Quality
11. Develop Entrepreneurial Skills
12. Maintain Business Resources
13. Develop A Sales Plan
14. Plan And Implement Business-To-Business Marketing
15. Address Customer Needs



Soil, Water and Fertilizer Testing Lab Technician



16. Solve Problems Which Jeopardize Safety And Security
 17. Apply problem solving techniques in the workplace using critical thinking
 18. Manage Personal Finances
 19. Coordinate A Work Team
 20. Lead Small Teams
 21. Manage Human Resource Services
- **Competencies to be gained after completion of course:**

At the end of the course, the trainee has attained the following core competencies:

1. Handling of sophisticated level Equipment 2
2. Perform Ammonical Nitrogen In Solid, Liquid and Mixed Fertilizer By Kjeldahl Method
3. Nitrate-N In Solid, liquid and mixed fertilizer by Kjeldahl method
4. Perform Uric/Urease nitrogen (n) in Solid, liquid and mixed fertilizer by Kjeldahl method
5. Perform Potassium (K) in Solid, Liquid and Mixed Fertilizer by Flame Photometry Method
6. Perform water soluble micronutrients (Zn, Fe, Mn etc) in Fertilizers through AAS Method
7. Perform Soil Micronutrient Test
8. Perform Standard Test Method (STM) for Zinc chelated percentage
9. Generate test report
10. Ensure Test Quality



Soil, Water and Fertilizer Testing Lab Technician



The entry for National Vocational Certificate level 5, in “**Soil, Water and Fertilizer Testing Lab Technician**” are given below:

- **Entry level of trainees:**

Title	Entry requirements
National Vocational Certificate level 5, in Soil, Water and Fertilizer Testing Lab Technician	Entry for assessment for this qualification is open. However, entry into formal training institutes, based on this qualification is candidate having Matric / equivalent Certificate with Science AND National Vocational Certificate level 4, in Soil, Water and Fertilizer Testing Lab Assistant

- **Minimum qualification of trainer/instructor:**

- Must be a holder of BS (4 years) in Agriculture Sciences with specialization in Soil
- Sciences or Chemistry
- Must be able to communicate effectively both orally and in written form.
- Must be able to perform all competences, given in **Soil, Water and Fertilizer Testing Lab Technician**

- **Recommended trainer: trainee ratio**

The recommended maximum trainer: trainee ratio for this program is 1 trainer for 20 to 25 trainees.

- **Medium of instruction i.e. language of instruction:**

Instructions will be in Urdu/ English/ Local language.



Soil, Water and Fertilizer Testing Lab Technician



- **Duration of the course (Total time, Theory & Practical time):**

The distribution of contact hours is given below:

Total	-	1200 hours
Theory	-	480 hours (40%)
Practical	-	720 hours (60%)



Soil, Water and Fertilizer Testing Lab Technician



- **Description and structure of the course**
Following is the structure of the course:

Level-5								
		Lab Technician						
1	Handling of sophisticated level Equipment 2		Level 5	Technical	40	60	100	10
2	Perform Ammonical Nitrogen In Solid, Liquid and Mixed Fertilizer By Kjeldahl Method		Level 5	Technical	40	60	100	10
3	Nitrate-N In solid, liquid and mixed fertilizer by Kjeldahl method		Level 5	Technical	48	72	120	12
4	Perform Uric/Urease nitrogen (n) in solid, liquid and mixed fertilizer by Kjeldahl method		Level 5	Technical	48	72	120	12
5	Perform Potassium (K) in Solid, Liquid and Mixed Fertilizer by Flame Photometry Method		Level 5	Technical	32	48	80	8
6	Perform water soluble micronutrients (Zn, Fe, Mn etc) in Fertilizers through AAS Method		Level 5	Technical	60	90	150	15
7	Perform Soil Micronutrient Test		Level 5	Technical	24	36	60	6
8	Perform Standard Test Method (STM) for Zinc chelated percentage		Level 5	Technical	32	48	80	8



Soil, Water and Fertilizer Testing Lab Technician



9	Perform Standard Test Method (STM) to evaluate Gypsum Requirement in soil		Level 5	Technical	32	48	80	8
10	Generate test report		Level 5	Technical	4	6	10	1
11	Ensure Test Quality		Level 5	Technical	8	12	20	2
	Occupation Total Hours				368	552	920	92
	Develop Entrepreneur Skills	Entrepreneur						
1	Develop Entrepreneurial Skills		Level 5	Generic	12	18	30	3
2	Maintain Business Resources		Level 5	Functional	12	18	30	3
3	Develop A Sales Plan		Level 5	Functional	12	18	30	3
4	Plan And Implement Business-To-Business Marketing		Level 5	Functional	12	18	30	3
5	Address Customer Needs		Level 5	Generic	8	12	20	2
6	Solve Problems Which Jeopardize Safety And Security		Level 5	Generic	12	18	30	3
7	Apply problem solving techniques in the workplace using critical thinking		Level 5	Functional	12	18	30	3
8	Manage Personal Finances		Level 5	Functional	8	12	20	2



Soil, Water and Fertilizer Testing Lab Technician



9	Coordinate A Work Team		Level 5	Functional	8	12	20	2
10	Lead Small Teams		Level 5	Functional	8	12	20	2
11	Manage Human Resource Services		Level 5	Functional	8	12	20	2
	Occupation Total Hours				112	168	280	28
	LEVEL-5 TOTAL HOUR				480	720	1200	120



Soil, Water and Fertilizer Testing Lab Technician



Level 5 (Technical Competencies)

Module 1: Handling of sophisticated level Equipment 2

Objective: After the completion of this module, the Trainee will be able to develop skill and competence required to use sophisticated equipment's that are used in different laboratory techniques for analysis of soil, water and fertilizer samples.

Duration: 100 Hrs.

Theory: 40 Hrs.

Practice: 60 Hrs.

Credit Hrs.: 10

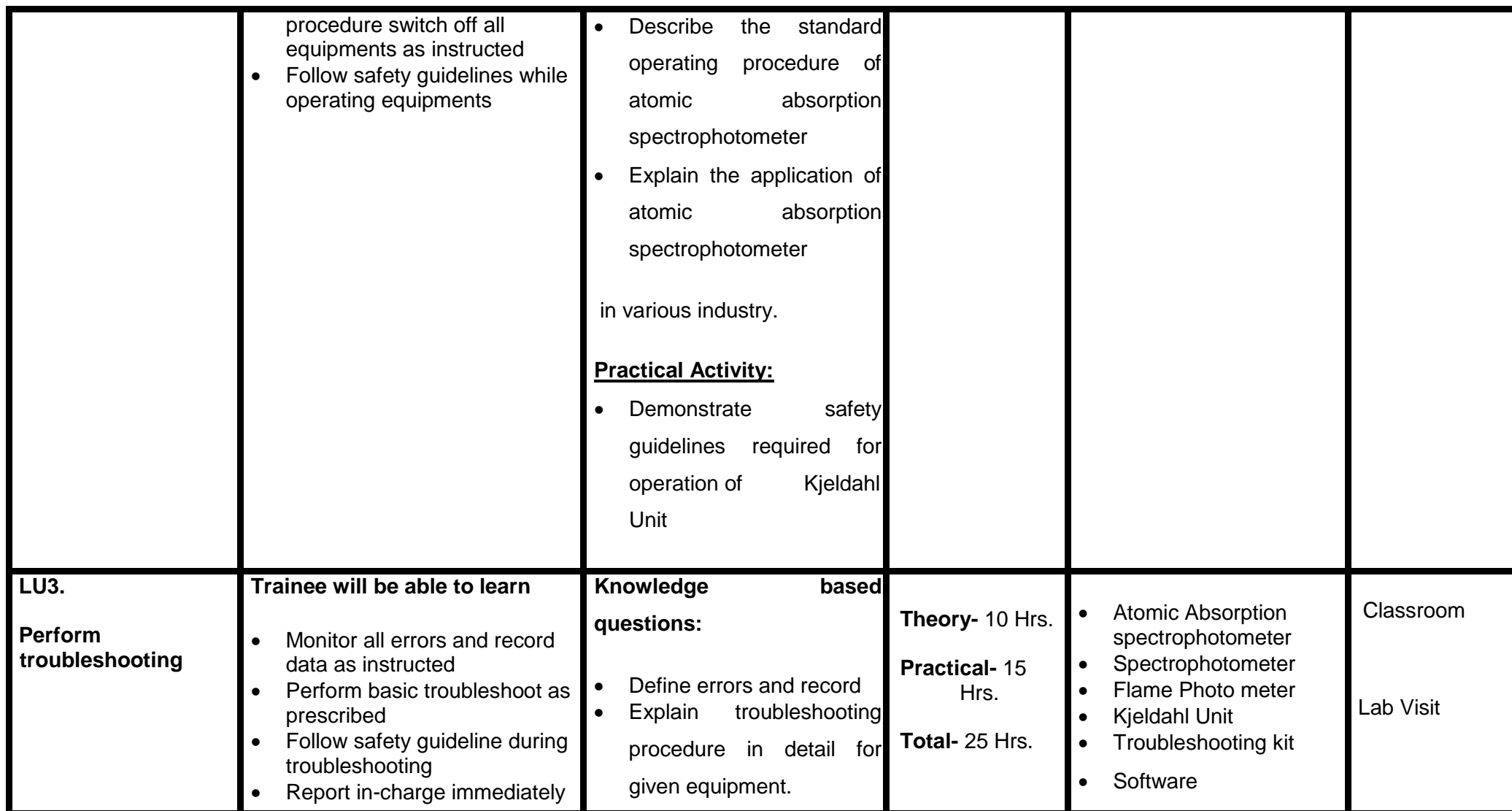
Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Maintain sophisticated level equipment 2	Trainee will be able to learn <ul style="list-style-type: none"> • Ensure cleanliness of equipment before and after use • Ensure availability of standard operating procedure for every equipment. • Maintain 'Repair and Maintenance history sheet' for each specific equipment as per given standard • Avoid self-repairing and adjustments of equipment 	Knowledge based questions: <ul style="list-style-type: none"> • Define the sophisticated equipment and its application. • Describe Safety guidelines of Flame Photo meter • Explain Principles and 	Theory- 10 Hrs. Practical- 15 Hrs. Total- 25 Hrs.	<ul style="list-style-type: none"> • Atomic Absorption spectrophotometer • Spectrophotometer • Flame Photo meter • Kjeldahl Unit • Flow injection analyser • Laminar flow 	Classroom Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> without informing in-charge • Ensure proper placing of equipment after use as per lab protocols • Maintain list of sophisticated level of equipment by following prescribed format • Periodically verify and update maintenance list according to plan • Follow safety guidelines as per equipment manual 	<p>working mechanisms of given sophisticated equipment</p> <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Demonstrate the use of sophisticated Equipment by performing different analysis in group or either individual basis. 			
LU2. Operate sophisticated equipment's.	Trainee will be able to learn <ul style="list-style-type: none"> • Follow SOPs for operating specific equipment as given in manuals • Inspect equipment properly before and after use • Operate sophisticated level of equipments only under presence of In-charge • Perform intermediate checks of equipment according to set instructions before use as per requirement • Inspect complete function of equipment • After completing standard 	Knowledge based questions: <ul style="list-style-type: none"> • Define the operating procedure and analysis mechanism in detail of given equipment. • Explain intermediate checks of given equipment. 	Theory- 10 Hrs. Practical- 15 Hrs. Total- 25 Hrs.	<ul style="list-style-type: none"> • Atomic Absorption spectrophotometer • Spectrophotometer • Flame Photo meter • Kjeldahl Unit • Operation manual • Equipment Software • Logbook • Operation checklist 	Classroom Lab Visit





Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> as instructed Maintain troubleshoot history sheet as instructed 	<ul style="list-style-type: none"> Explain the safety procedure required during troubleshooting <p><u>Practical Activity:</u></p> <p>Prepare troubleshooting history sheet of equipment</p>			
LU4. Calibrate equipment	lab Trainee will be able to learn <ul style="list-style-type: none"> Prepare document for calibrating equipments as instructed Maintain reference standard record as instructed Calibrate instruments as per given procedures in manuals Manage calibrations from authorized service provider if required as per given standard Distinguish calibrated and non calibrated instruments with labels as instructed 	Knowledge based questions: <ul style="list-style-type: none"> Define the calibration procedure Explain the calibration goal Explain reference standard record <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Perform calibration of Atomic Absorption spectrophotometer 	Theory- 10 Hrs. Practical- 15 Hrs. Total- 25 Hrs.	<ul style="list-style-type: none"> Atomic Absorption spectrophotometer Spectrophotometer Flame Photo meter Kjeldahl Unit Certified reference materials for calibration 	Classroom Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



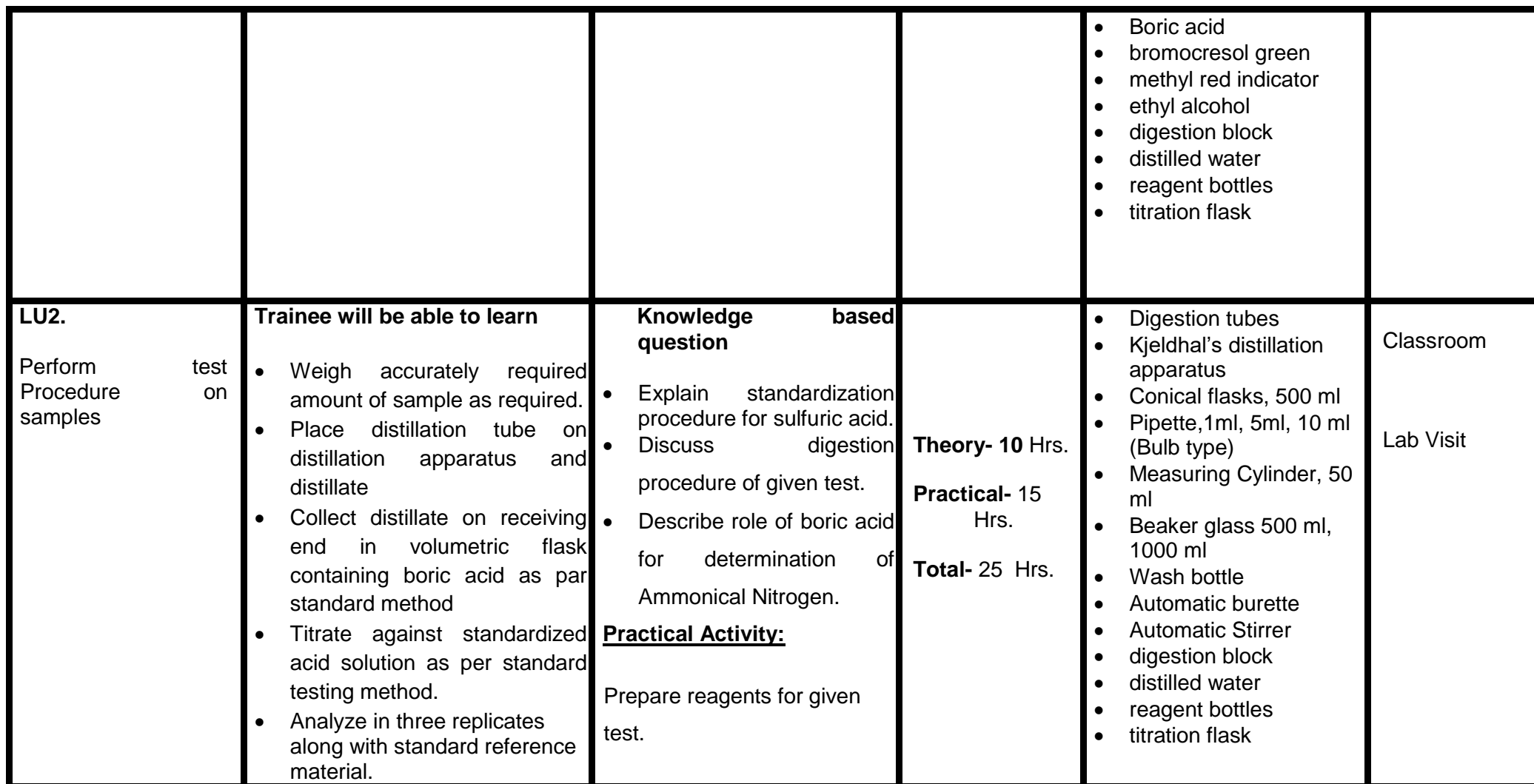
--	--	--	--	--	--

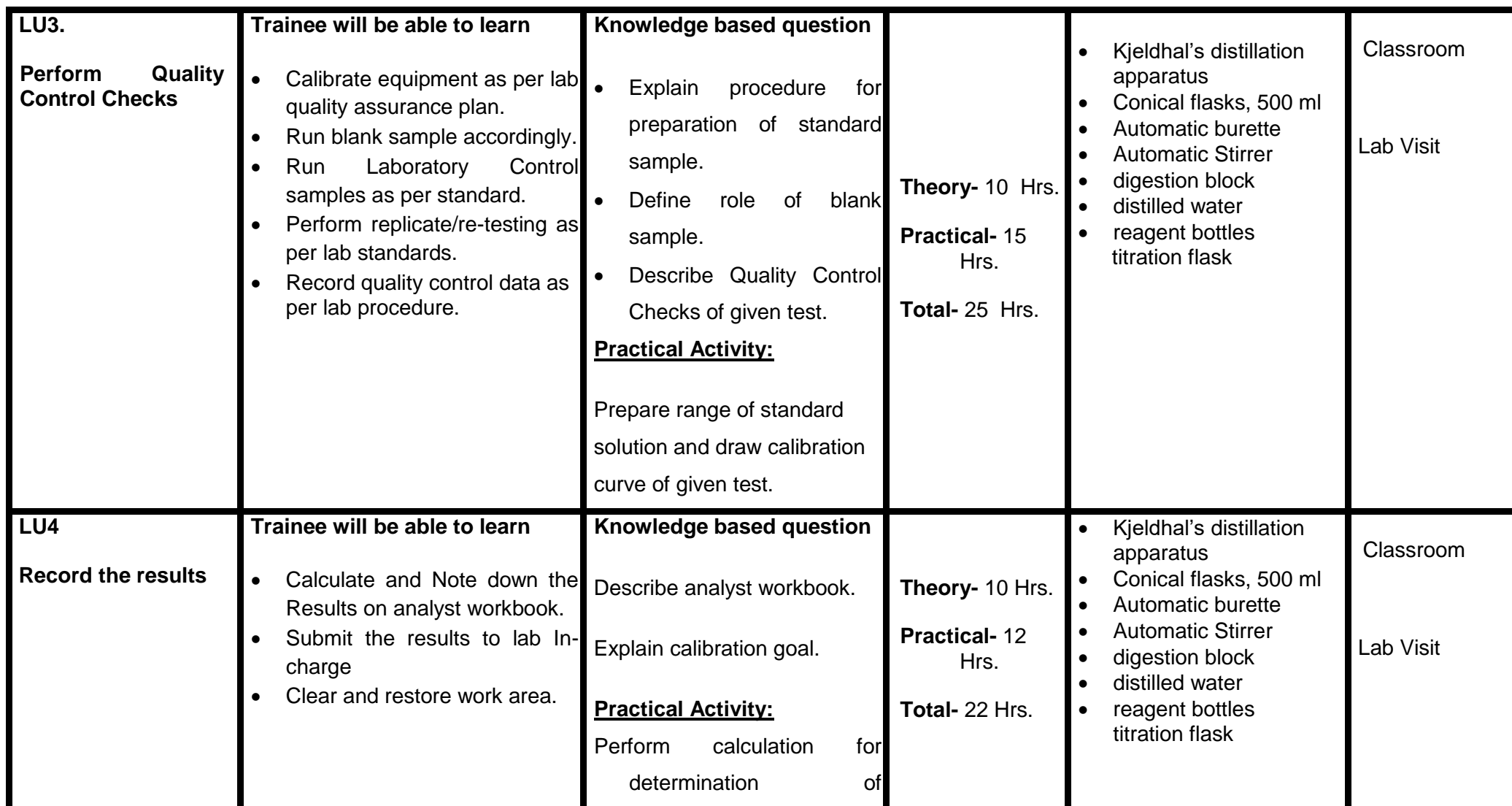


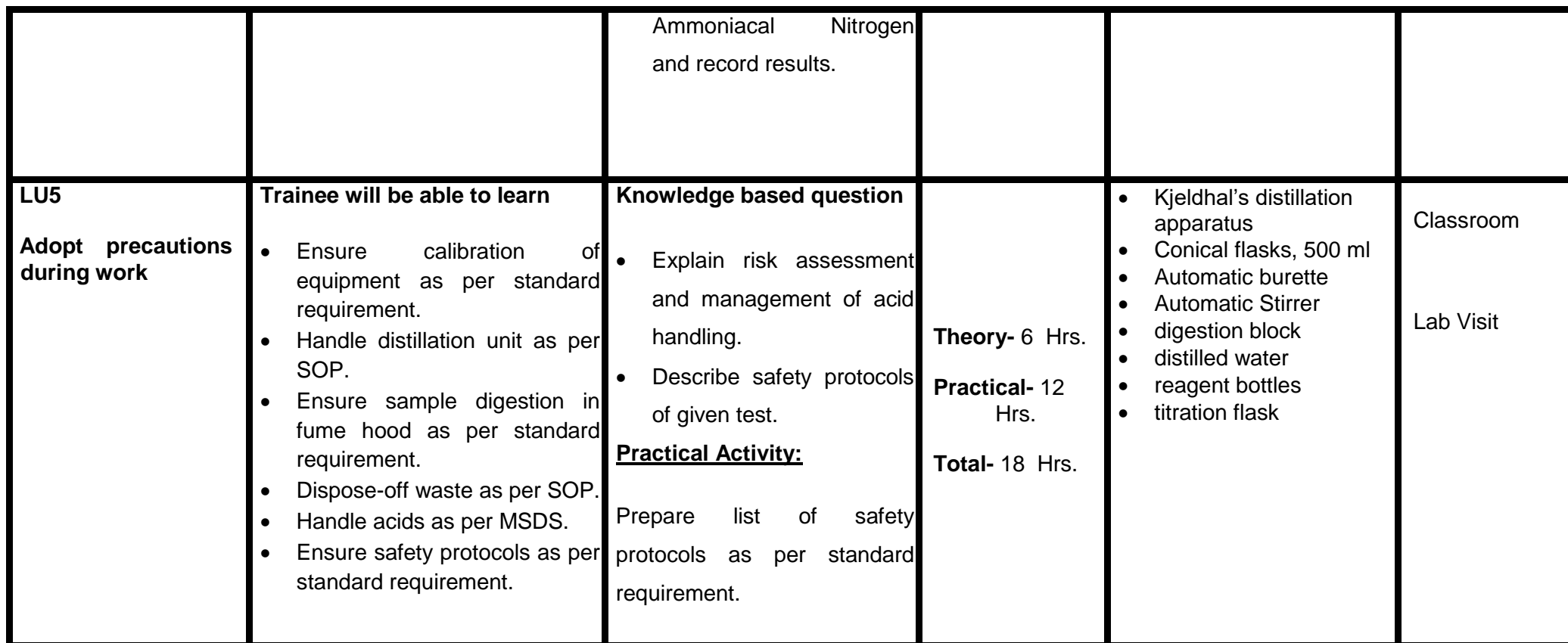
Objective: After the completion of this module, the Trainee will be able to develop the knowledge required to preparation of samples for testing, test procedures, Quality Control Checks, results calculation, safety precautions and record data.

Credit Hrs.: 10

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to learn <ul style="list-style-type: none"> Check sample label for required test. Maintain the Laboratory room temperature as per requirement. Check for availability of N standard as per requirement. Set up Kjeldahl apparatus and reagents in accordance with the standard work instructions. Conduct pre-use and safety checks. 	Knowledge based question Explain principle of Kjeldahl Method Describe role of Ammonical Nitrogen as fertilizer. <u>Practical Activity:</u> Set up Kjeldahl apparatus.	Theory- 4 Hrs. Practical- 6 Hrs. Total- 10 Hrs.	<ul style="list-style-type: none"> Digestion tubes Kjeldhal's distillation apparatus Conical flasks, 500 ml Pipette, 1ml, 5ml, 10 ml (Bulb type) Measuring Cylinder, 50 ml Beaker glass 500 ml, 1000 ml Wash bottle Automatic burette Automatic Stirrer H₂SO₄. NaOH. potassium hydrogen phthalate 	Classroom Lab Visit





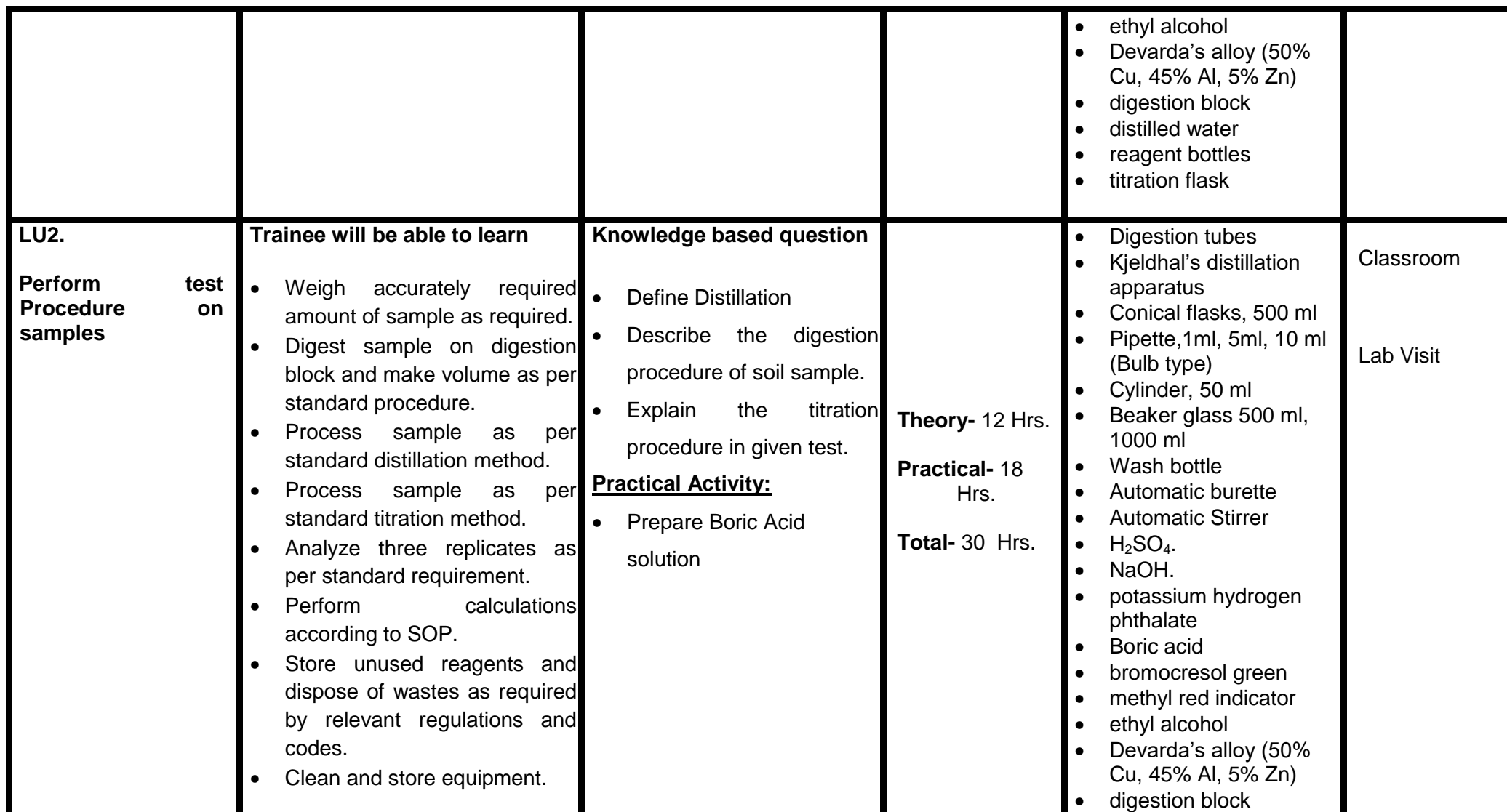


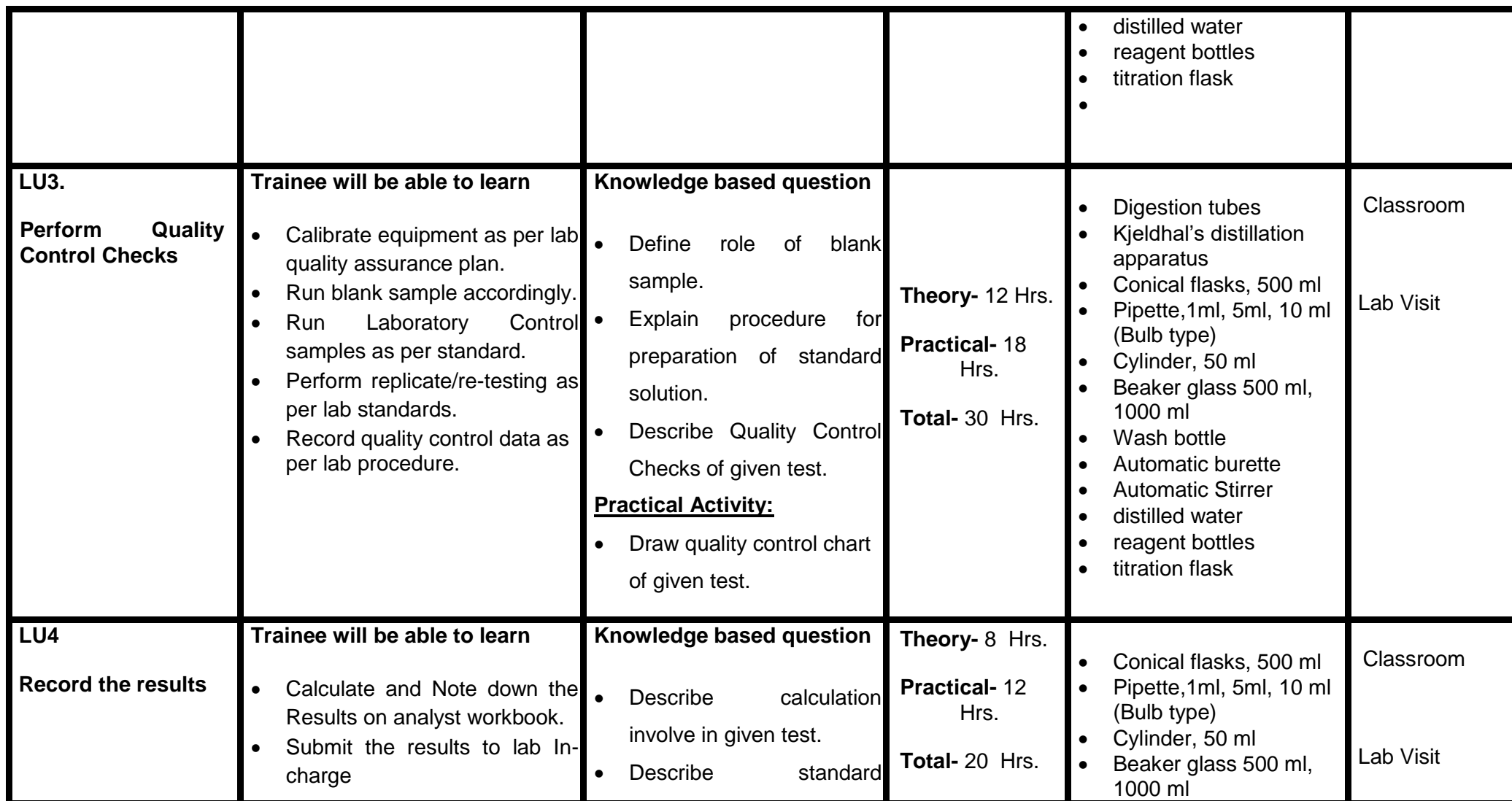


Objective: This competency standard covers the skill and knowledge required to Preparation samples for testing, test procedures, Quality Control Checks, results calculation, safety precautions and record data

Duration: 120 Hrs.

Theory: 48 Hrs.**Practice: 72 Hrs.****Credit Hrs.: 12**[illegible]







Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> • Clear and restore work area. 	<p>protocol for record keeping</p> <p><u>Practical Activity:</u></p> <p>Demonstrate results using standard formula</p>		<ul style="list-style-type: none"> • Wash bottle • Automatic burette • Automatic Stirrer • distilled water • reagent bottles • titration flask 	
<p>LU5</p> <p>Adopt precautions during work</p>	<p>Trainee will be able to learn</p> <ul style="list-style-type: none"> • Ensure calibration of equipment as per standard requirement. • Handle distillation unit as per SOP. • Ensure sample digestion in fume hood as per standard requirement. • Dispose-off waste as per SOP. • Handle acids as per MSDS. • Ensure safety protocols as per standard requirement. 	<p>Knowledge based questions.</p> <ul style="list-style-type: none"> • Define MSDS • Explain the role of fume hood in lab during digestion of sample. • Describe safety protocols of given test. <p><u>Practical Activity:</u></p> <p>Draw calibration chart of Nitrate- N Standards.</p>	<p>Theory- 8 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 20 Hrs.</p>	<ul style="list-style-type: none"> • Kjeldhal's distillation apparatus • Conical flasks, 500 ml • Pipette, 1ml, 5ml, 10 ml (Bulb type) • Cylinder, 50 ml • Beaker glass 500 ml, 1000 ml • Wash bottle • Automatic burette • Automatic Stirrer • distilled water • reagent bottles • titration flask 	<p>Classroom</p> <p>Lab Visit</p>



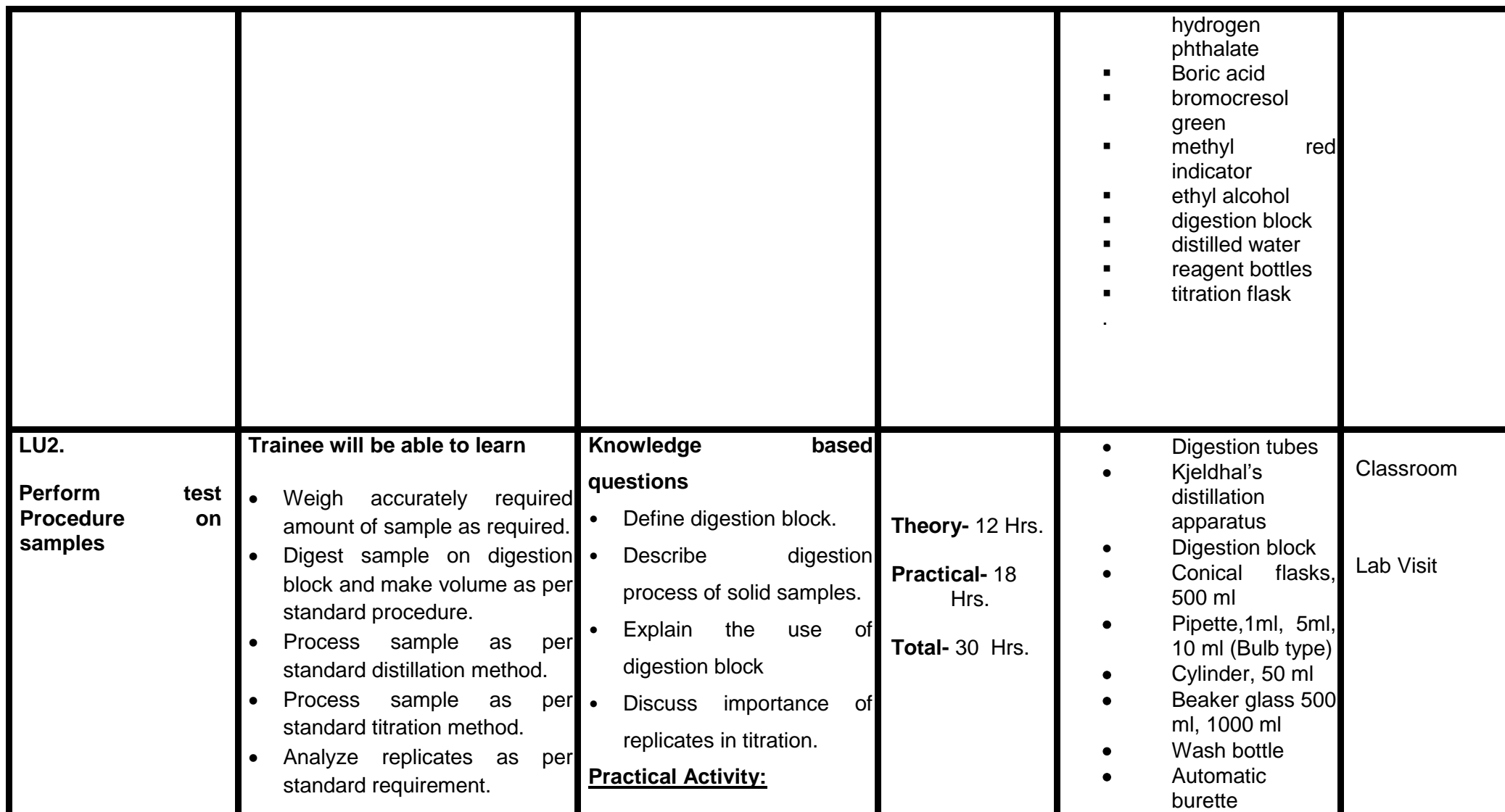
Objective: This competency standard covers the skill and knowledge required to Preparation samples for testing, test procedures, Quality Control Checks, results calculation, safety precautions and record data.

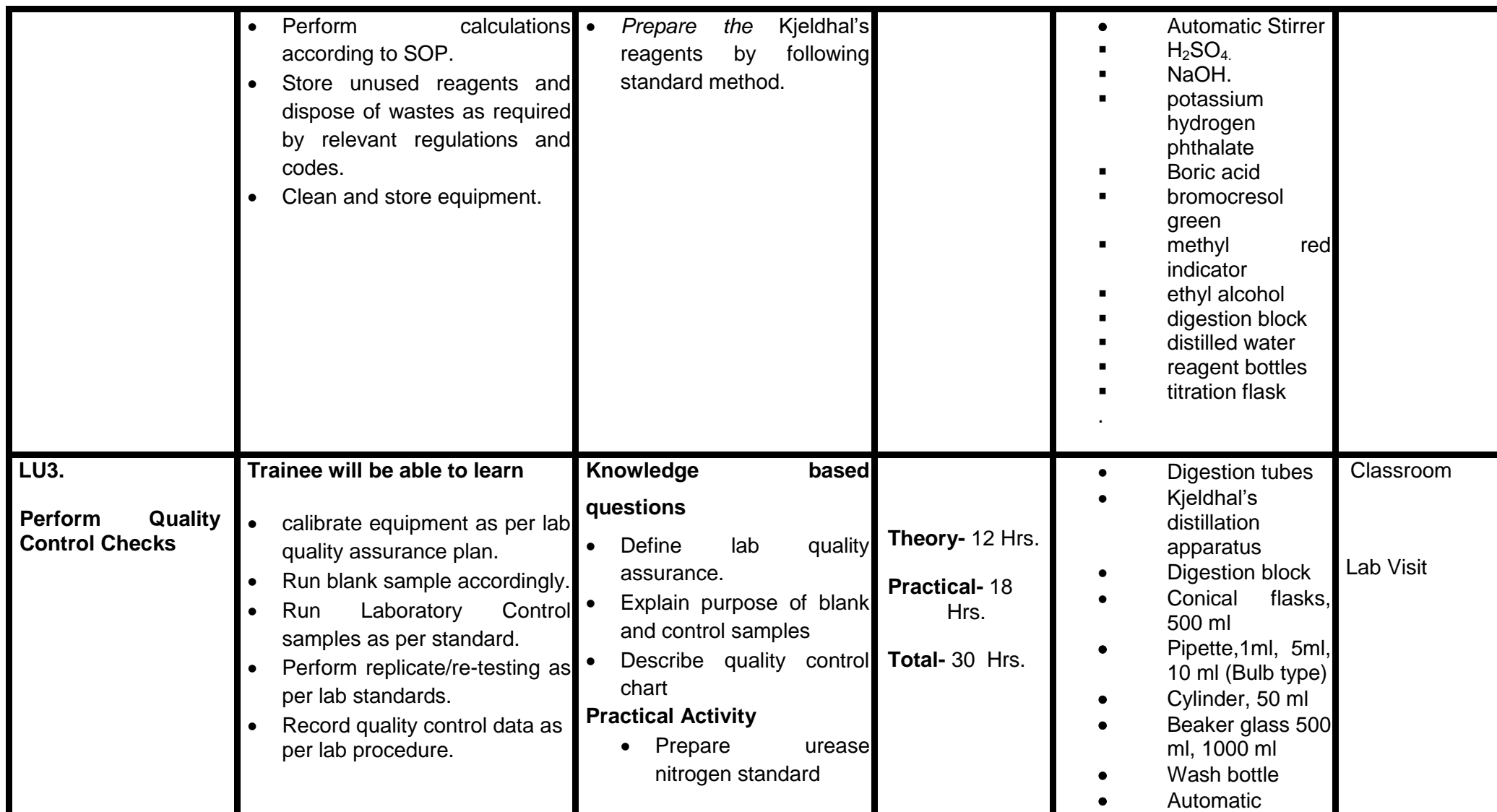
Duration: 120 Hrs.

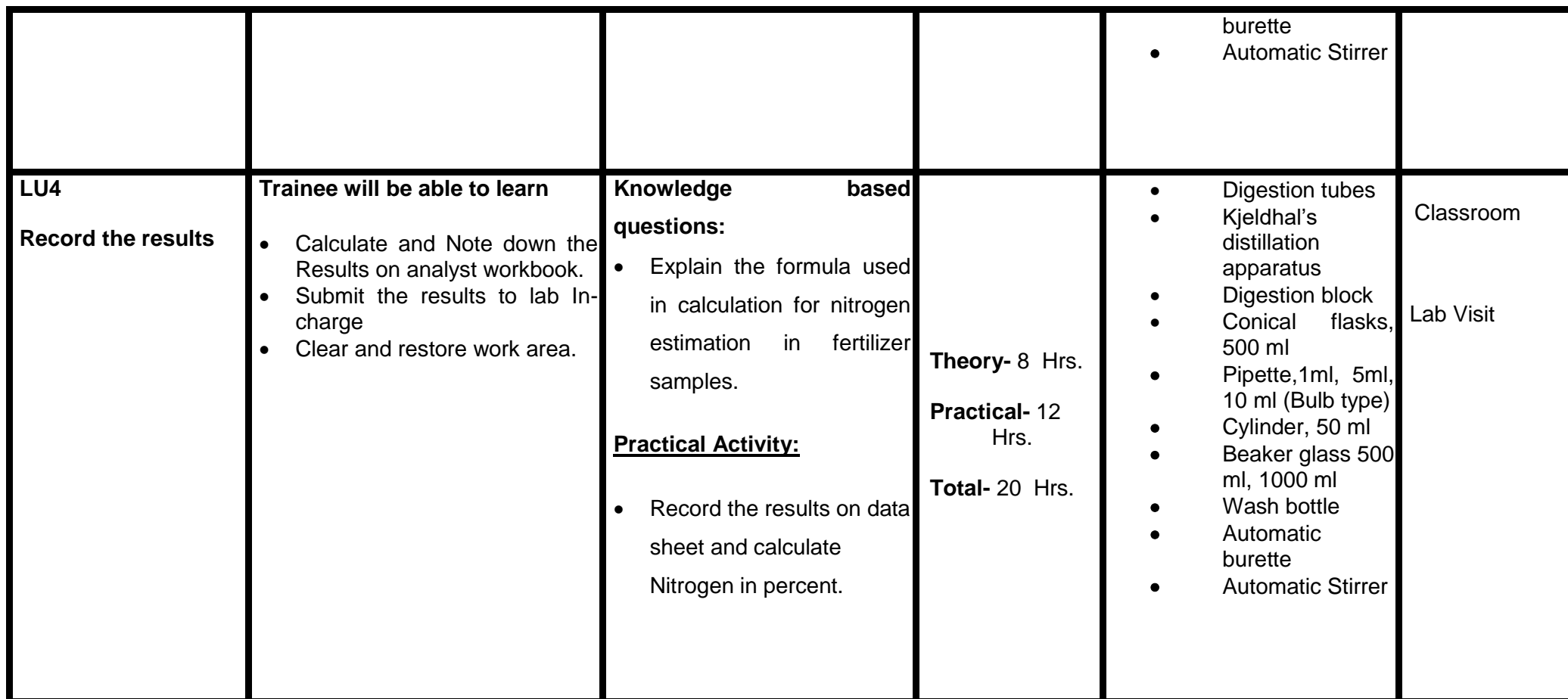
Theory: 48 Hrs.**Practice: 72 Hrs.**

Credit Hrs.: 12

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LUI.	Trainee will be able to learn	Knowledge based questions:		• Digestion tubes • Kjeldhal's distillation apparatus	Class Room
Perform Prerequisites for testing	<ul style="list-style-type: none"> Check sample label for required test. Maintain Laboratory room temperature as per requirement. Check for availability of N standard as per requirement. Set up KJELDAHL apparatus and reagents in accordance with the standard work instructions. Conduct pre-use and safety checks. 	• Explain the Role of uric/urease as <i>nitrogen fertilizer</i> . • <i>Describe use of nitrogen standard in given test.</i>	Theory- 8 Hrs. Practical- 12 Hrs. Total- 20 Hrs.	• Digestion block • Conical flasks, 500 ml • Pipette, 1ml, 5ml, 10 ml (Bulb type) • Cylinder, 50 ml • Beaker glass 500 ml, 1000 ml • Wash bottle • Automatic burette • Automatic Stirrer ▪ H ₂ SO ₄ . ▪ NaOH. ▪ potassium	Lab Visit
		<u>Practical Activity:</u> • Set up KJELDAHL apparatus.			









Soil, Water and Fertilizer Testing Lab Technician



<p>LU5</p> <p>Adopt precautions during work</p>	<p>Trainee will be able to learn</p> <ul style="list-style-type: none"> • Ensure calibration of equipment as per standard requirement. • Handle distillation unit as per SOP. • Ensure sample digestion in fume hood as per standard requirement. • Dispose-off waste as per SOP. • Handle acids as per MSDS. • Ensure safety protocols as per standard requirement. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Define MSDS • Explain the important safety rules for distillation. • Discuss the importance of Fume hood. • Explain lab safety protocols. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Enlist the precautionary measures for handling of hazardous chemicals 	<p>Theory- 8 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 20 Hrs.</p>	<ul style="list-style-type: none"> • Digestion tubes • Kjeldhal's distillation apparatus • Digestion block • Conical flasks, 500 ml • Pipette, 1ml, 5ml, 10 ml (Bulb type) • Cylinder, 50 ml • Beaker glass 500 ml, 1000 ml • Wash bottle • Automatic burette • Automatic Stirrer 	<p>Classroom</p> <p>Lab Visit</p>
---	---	--	--	---	-----------------------------------



Objective: This competency standard covers the skill and knowledge required to prepare samples for laboratory testing, testing procedure for testing Potassium in Water, Quality checks, calculation of results and precautions adopted for performing test.

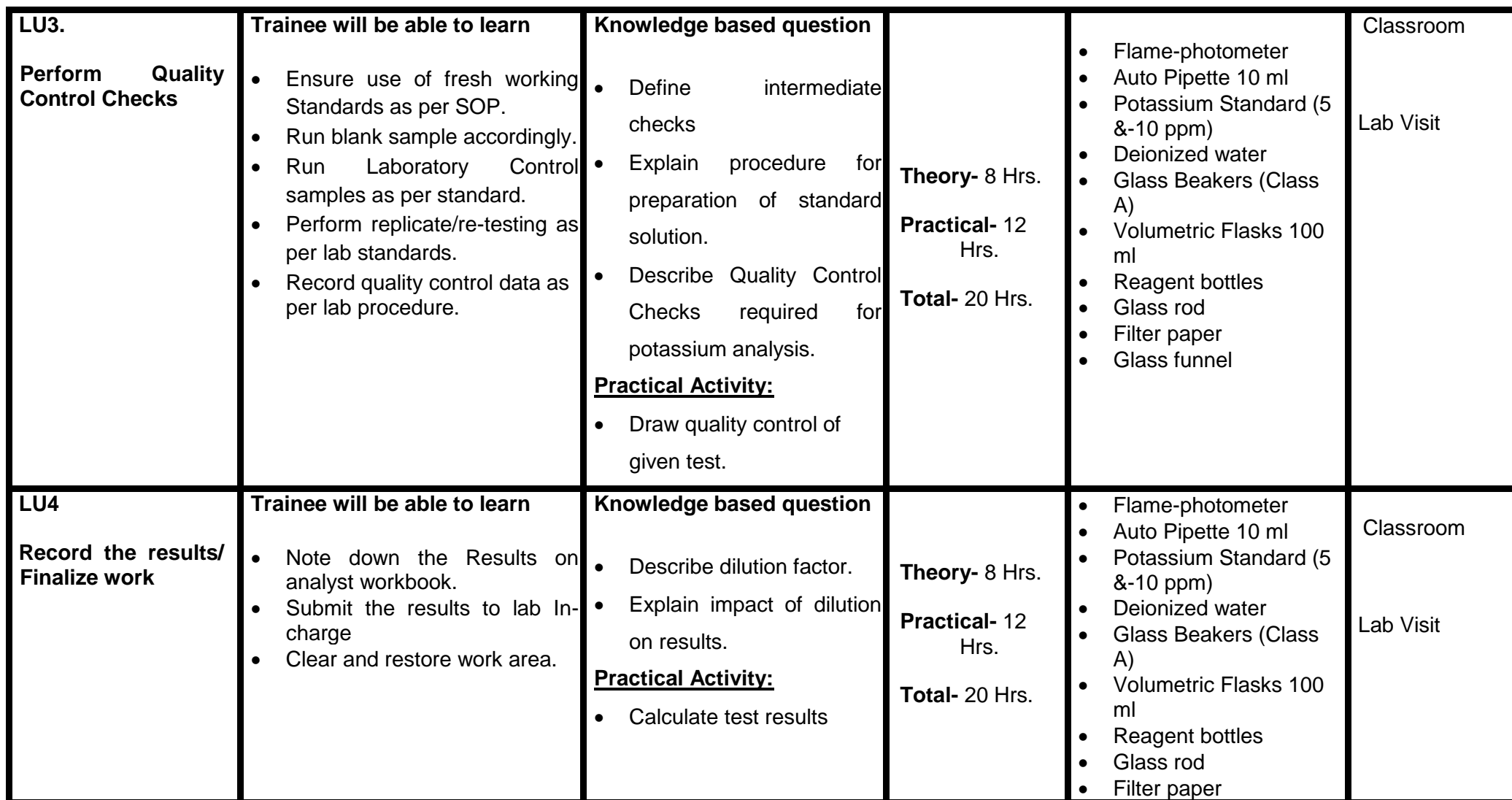
Duration: 80 Hrs.

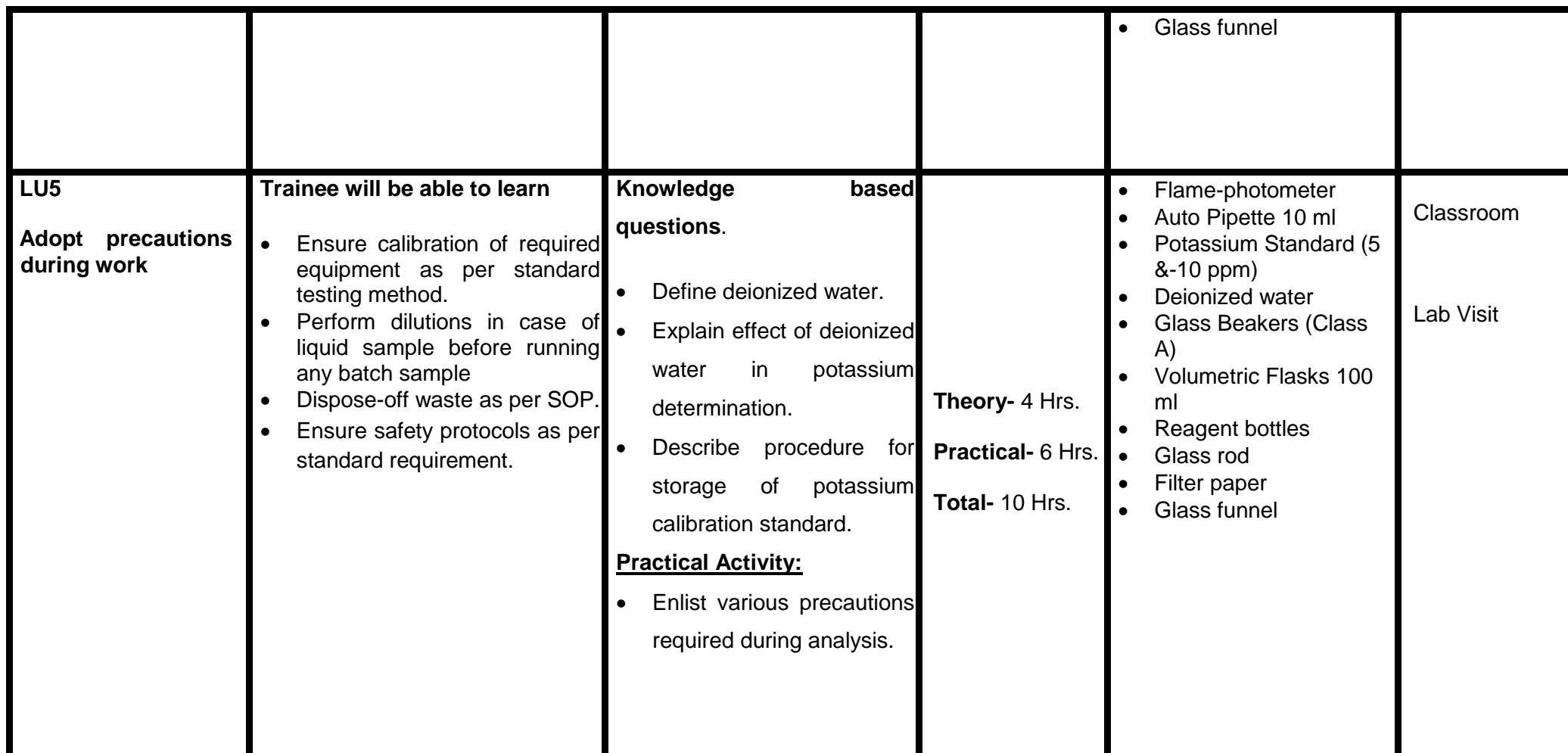
Theory: 32 Hrs.

Practice: 48 Hrs.

Credit Hrs.: 8

[illegible]







Objective: This competency standard covers the skill and knowledge required to Preparation samples for testing, test procedures, Quality Control Checks, results calculation, safety precautions and record data.

Credit Hrs.: 15

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LUI.	Trainee will be able to learn	Knowledge based question			
Perform Prerequisites for testing	<ul style="list-style-type: none"> Check sample label for required test. Maintain Laboratory room temperature as per requirement. Keep the sample at room temperature for few minutes. Set up equipment and reagents in accordance with the standard work instructions. Conduct pre-use and safety checks. 	<ul style="list-style-type: none"> Define water soluble micronutrients. Explain role of Zn, Fe, Mn as Fertilizers. Explain safety checks required to operate Atomic Absorption Spectrophotometer <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Prepare work instruction for operation of Atomic Absorption Spectrophotometer 	<p>Theory- 6 Hrs. Practical- 9 Hrs. Total- 15 Hrs.</p>	<ul style="list-style-type: none"> Wash bottle Atomic Absorption Spectrophotometer Volumetric flask Funnel Filter Paper Pipette Standard solutions/certified reference material (CRM) of desired micronutrient 	Classroom Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



<p>LU2.</p> <p>Perform Procedure samples</p> <p>test on</p>	<p>Trainee will be able to learn</p> <ul style="list-style-type: none"> • Prepare sample according to test requirement • Weight sample according to test requirement • Take required aliquot from filtered sample as per STM. • Prepare standards solutions for micronutrient according to range. • Use relevant atomic lamp as per requirement. • Aspire standard working solutions of micronutrient in AAS as per SOP. • Aspire sample solution in AAS as per STM. • Read Absorbance and prepare standard curve according to SOP. • Perform calculations as per prescribed formula • Store unused reagents and dispose of wastes as required by relevant regulations and codes. • Clean and store equipment as per lab protocol 	<p>Knowledge based question</p> <p>Define the operating procedure of Atomic Absorption Spectrophotometer.</p> <p>Describe sample preparation of soil and water for determination of micronutrient.</p> <p>Discuss the application of Atomic Absorption Spectrophotometer in industry.</p> <p><u>Practical Activity:</u></p> <p>Draw calibration curve.</p>	<p>Theory- 24 Hrs.</p> <p>Practical- 36 Hrs.</p> <p>Total- 60 Hrs.</p>	<ul style="list-style-type: none"> • Wash bottle • Atomic Absorption Spectrophotometer • Volumetric flask • Funnel • Filter Paper • Pipette • Standard solutions/ certified reference material (CRM) of desired micronutrient 	<ul style="list-style-type: none"> • Classroom • Lab Visit
--	---	--	---	--	--



Soil, Water and Fertilizer Testing Lab Technician



<p>LU3.</p> <p>Perform Quality Control Checks</p>	<p>Trainee will be able to learn</p> <ul style="list-style-type: none"> • Run Laboratory Control samples as per standard. • Perform replicate/re-testing as per lab standards. • Record quality control data as per lab procedure. • Prepare quality control charts of quality assurance activities according to lab procedure • Always used valid standards 	<p>Knowledge based questions</p> <ul style="list-style-type: none"> • Define quality control charts. • Describe validity of standards. • Discuss the importance of quality control charts. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Prepare quality control charts for quality assurance of given test. 	<p>Theory- 12 Hrs.</p> <p>Practical- 18 Hrs.</p> <p>Total- 30 Hrs.</p>	<ul style="list-style-type: none"> • Wash bottle • Atomic Absorption Spectrophotometer • Volumetric flask • Funnel • Filter Paper • Pipette • Standard solutions/ certified reference material (CRM) of desired micronutrient 	<ul style="list-style-type: none"> • Classroom • Lab Visit
<p>LU4</p> <p>Record the results</p>	<p>Trainee will be able to learn</p> <ul style="list-style-type: none"> • Calculate and Note down the Results on analyst workbook. • Perform detail calculations • Submit the results to lab In-charge 	<p>Knowledge based questions</p> <ul style="list-style-type: none"> • Differentiate between ppm and ppb solutions. 	<p>Theory- 12 Hrs.</p> <p>Practical- 18 Hrs.</p> <p>Total- 30 Hrs.</p>	<ul style="list-style-type: none"> • Wash bottle • Atomic Absorption Spectrophotometer • Volumetric flask • Funnel • Filter Paper • Pipette 	<ul style="list-style-type: none"> • Class Room • Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> • Clear and restore work area. 	<ul style="list-style-type: none"> • Describe dilution factor. <p><u>Practical Activity:</u></p> <p>Prepare 1, 2 and 4 ppm solution of Zn</p>		<ul style="list-style-type: none"> • Standard solutions/ certified reference material (CRM) of desired micronutrient 	
LU5 Adopt precautions during work	Trainee will be able to learn <ul style="list-style-type: none"> • Ensure before taking any measurement that instrument has been calibrated. • Perform dilutions if required • Always use perform pre and post acid washing 	Knowledge based questions <ul style="list-style-type: none"> • Explain safety precaution required to operate AAS • Describe significance of acid washing for glass apparatus. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Perform acid washing for glass apparatus. 	Theory- 6 Hrs. Practical- 9 Hrs. Total- 15 Hrs.	<ul style="list-style-type: none"> • Wash bottle • Atomic Absorption Spectrophotometer • Volumetric flask • Funnel • Filter Paper • Pipette • Standard solutions/ certified reference material (CRM) of desired micronutrient 	<ul style="list-style-type: none"> • Classroom • Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



Module 7: Perform Soil Micronutrient Test

Objective: This competency standard covers the skill and knowledge required to Preparation samples for testing, test procedures, Quality Control Checks, results calculation, safety precautions and record data.

Duration: 60 Hrs.

Theory: 24 Hrs.

Practice: 36 Hrs.

Credit Hrs.: 6

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to learn <ul style="list-style-type: none"> Check the sample label for the required test. Maintain the Laboratory room temperature as per requirement. Arrange equipment and safety requirements as per standard method. Set up equipment in accordance with the standard work instructions. Conduct pre-use and safety checks. 	Knowledge based questions <ul style="list-style-type: none"> Differentiate between micro and macronutrients Describe the role of Fe Explain basic principles of soil micronutrients determination. <u>Practical Activity:</u> <ul style="list-style-type: none"> Preparation of soil samples for micronutrient analysis 	Theory- 4 Hrs. Practical- 6 Hrs. Total- 10 Hrs.	<ul style="list-style-type: none"> Analytical Balance Atomic Absorption Spectrophotometer. Extraction/Reagent Bottles conical flasks Filter Paper DPTA, Calcium chloride, Triethanolamine (TEA). Deionized water 	<ul style="list-style-type: none"> Class Room Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



LU2. Perform Procedure test on samples	Trainee will be able to learn <ul style="list-style-type: none"> Take required amount of soil as per recommended procedure. Add recommended amount of extracting solution and allow shaking as per standard method. Filter solution to obtain clean filtrate as per standard procedure. Prepare micronutrients (Zn, Cu, Fe, Mn) standards as per requirement. Observe reading separately for each parameter on Atomic Absorption Spectrophotometer as per standard method. 	Knowledge based questions: <ul style="list-style-type: none"> Define TEA and DPTA Discuss the role of micronutrients (Zn, Cu, Mn) in soil Explain the principle and working of Atomic Absorption Spectrophotometer Practical Activity: <ul style="list-style-type: none"> Preparation of Mn standards as per SOP. 	Theory- 8 Hrs. Practical- 12 Hrs. Total-20 Hrs.	<ul style="list-style-type: none"> Analytical Balance Atomic Absorption Spectrophotometer. Extraction/Reagent Bottles conical flasks Filter Paper DPTA, Calcium chloride, Triethanolamine (TEA). Deionized water 	<ul style="list-style-type: none"> Class Room Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



LU3. Perform Quality Control Checks	Trainee will be able to learn <ul style="list-style-type: none"> • Turn on instrument as per operating manual. • Run blank sample accordingly. • Run Laboratory Control samples as per standard. • Perform replicate/re-testing as per lab standards. • Record quality control data as per lab procedure. • Calibrate instrument using metal standards as per procedure. 	Knowledge based questions: <ul style="list-style-type: none"> • Define quality control test. • Explain intermediate check of Atomic Absorption Spectrophotometer <u>Practical Activity:</u> <ul style="list-style-type: none"> • Calibrate the given instrument using available standards. 	Theory- 6 Hrs. Practical- 9 Hrs. Total- 15 Hrs.	<ul style="list-style-type: none"> • Analytical Balance • Atomic Absorption Spectrophotometer. • Extraction/Reagent Bottles • conical flasks • Filter Paper • DPTA, Calcium chloride, Triethanolamine (TEA). • Deionized water 	<ul style="list-style-type: none"> • Class room • Lab Visit
LU4 Record the results	Trainee will be able to learn <ul style="list-style-type: none"> • Calculate soil micronutrients using standard formula. • Submit the results to lab In-charge • Clear and restore work area. 	Knowledge based questions <ul style="list-style-type: none"> • Explain the guidelines for reporting accurate and relevant results. • Describe the standard formula for calculation of soil micronutrients. <u>Practical Activity:</u>	Theory- 4 Hrs. Practical- 6 Hrs. Total- 10 Hrs.	<ul style="list-style-type: none"> • Analytical Balance • Atomic Absorption Spectrophotometer. • Extraction/Reagent Bottles • conical flasks • Filter Paper • DPTA, Calcium chloride, Triethanolamine (TEA). • Deionized water 	<ul style="list-style-type: none"> • Class Room • Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



		<ul style="list-style-type: none"> Draw calibration curve 			
LU5 Adopt precautions during work	Trainee will be able to learn <ul style="list-style-type: none"> Ensure calibration of equipment as per standard method. Use clean and good quality glassware as per standard method Always prepare fresh working standards for accurate results. Ensure safety protocols as per standard method. 	Knowledge based questions: <ul style="list-style-type: none"> Define working standards. Describe the safety guidelines for efficient working of given instrument. <u>Practical Activity</u> <ul style="list-style-type: none"> Enlist work instruction of given instrument. 	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none"> Analytical Balance Atomic Absorption Spectrophotometer. Extraction/Reagent Bottles conical flasks Filter Paper DPTA, Calcium chloride, Triethanolamine (TEA). Deionized water 	<ul style="list-style-type: none"> Class Room Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



Module 8: Perform Standard Test Method (STM) for Zinc chelated percentage

Objective: This competency standard covers the skill and knowledge required to Preparation samples for testing, test procedures, Quality Control Checks, results calculation, safety precautions and record data.

Duration: 80 Hrs.

Theory: 32 Hrs.

Practice: 48 Hrs.

Credit Hrs.: 8

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare samples for testing	Trainee will be able to learn <ul style="list-style-type: none"> Check the sample label as per requirement of test Keep the sample at room temperature Prepare the sample as per test procedure Ensure the availability of reagents/media as per test requirement Arrange related equipment as per protocol Ensure safe calibration of equipment as per requirement Ensure safety requirements as 	Knowledge based questions: <ul style="list-style-type: none"> Define HPLC Define chelation. Explain standard test method for determination of zinc chelated percentage. <u>Practical Activity:</u> <ul style="list-style-type: none"> Set up apparatus for analysis of zinc in given sample. 	Theory- 4 Hrs. Practical- 6 Hrs. Total- 10 Hrs.	<ul style="list-style-type: none"> Analytical Balance HPLC Atomic Absorption spectrophotometer Volumetric and conical flask Extraction/Reagent Bottles, conical flasks Mechanical shaker Pipette Burette Funnels Reference standard material 	<ul style="list-style-type: none"> Class Room Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



	per protocol				
LU2. Perform test Procedure	Trainee will be able to learn <ul style="list-style-type: none"> • Weigh specific amount of sample as per requirement • Perform the test as per lab protocol • Calculate results as per prescribed formula • Analyze in three replicates • Store unused reagents • Dispose of wastes as required • Clean and store equipment. 	Knowledge based questions: <ul style="list-style-type: none"> • Discuss types of Zinc chelation. • Describe the benefits of chelated zinc. • Describe reagents for extraction. <u>Practical Activity:</u> <ul style="list-style-type: none"> • Prepare standard solutions of Zinc ions. 	Theory- 8 Hrs. Practical- 12 Hrs. Total- 20 Hrs.	<ul style="list-style-type: none"> • Analytical Balance • HPLC • Atomic Absorption spectrophotometer • Volumetric and conical flask • Extraction/Reagent Bottles, conical flasks • Mechanical shaker • Pipette • Burette • Funnels • Reference standard material 	<ul style="list-style-type: none"> • Class Room • Lab Visit
LU3. Perform Quality Control Checks	Trainee will be able to learn <ul style="list-style-type: none"> • Run blank sample accordingly. • Turn on equipment as per standard manual • Run Laboratory Control samples as per standard. 	Knowledge based questions: <ul style="list-style-type: none"> • Explain the purpose of chelated zinc • Explain the working 	Theory- 8 Hrs. Practical- 12 Hrs. Total- 20 Hrs.	<ul style="list-style-type: none"> • Analytical Balance • HPLC • Atomic Absorption spectrophotometer • Volumetric and conical flask 	<ul style="list-style-type: none"> • Class room • Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> Perform replicate/re-testing as per lab standards. Record quality control data as per lab procedure. Ensure standardization of solution and reagents as per standard method 	<p>principle of HPLC.</p> <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Draw QC chart of Zn Standard. 		<ul style="list-style-type: none"> Extraction/Reagent Bottles, conical flasks Mechanical shaker Pipette Burette Funnels Reference standard material 	
LU4 Record the results/Finalize work	Trainee will be able to learn <ul style="list-style-type: none"> Calculate as per standard formula. Submit the results to lab In-charge Clear and restore work area. 	Knowledge based questions: <ul style="list-style-type: none"> Explain the formula for zinc chelated percentage. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Estimate the percentage of chelated zinc in given sample 	Theory- 8 Hrs. Practical- 12 Hrs. Total- 20 Hrs.	<ul style="list-style-type: none"> Analytical Balance HPLC Atomic Absorption spectrophotometer Volumetric and conical flask Extraction/Reagent Bottles, conical flasks Mechanical shaker Pipette Burette Funnels Reference standard material 	<ul style="list-style-type: none"> Class Room Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



<p>LU5</p> <p>Adopt precautions during work</p>	<p>Trainee will be able to learn</p> <ul style="list-style-type: none"> • Use clean and good quality glassware as per standard method • Always prepare fresh working standards for accurate results. • Ensure safety protocols as per standard method. • Ensure calibration as per standard requirements 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Discuss the safety protocols as per standard method. • Explain the importance of calibration <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Enlist precautionary measure required to conduct test. 	<p>Theory- 4 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 10 Hrs.</p>	<ul style="list-style-type: none"> • Analytical Balance • HPLC • Atomic Absorption spectrophotometer • Volumetric and conical flask • Extraction/Reagent Bottles, conical flasks • Mechanical shaker • Pipette • Burette • Funnels • Reference standard material 	<ul style="list-style-type: none"> • Classroom • Lab Visit
---	---	--	---	--	--



Soil, Water and Fertilizer Testing Lab Technician



Module 9: Perform Standard Test Method (STM) to evaluate Gypsum Requirement in soil

Objective: This competency standard will enable the trainee to Determination of Gypsum Requirement of saline sodic and sodic soil

Duration: 80 Hrs.

Theory: 32 Hrs.

Practice: 48 Hrs.

Credit Hrs.: 8

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. CU1. Prepare samples for testing	Trainee will be able to learn <ul style="list-style-type: none"> Check the sample label as per requirement of test Keep the sample at room temperature Prepare the sample as per test procedure Ensure the availability of reagents/media as per test requirement Arrange related equipment as per protocol Ensure safe calibration of equipment as per requirement Ensure safety requirements as per protocol 	Knowledge based questions: <ul style="list-style-type: none"> Define salinity Define sodicity Explain role of gypsum in soil. <u>Practical Activity:</u> <ul style="list-style-type: none"> Set up apparatus for analysis of gypsum requirement in given sample. 	Theory- 4 Hrs. Practical- 6 Hrs. Total- 10 Hrs.	<ul style="list-style-type: none"> ➤ Analytical Balance ➤ Volumetric and conical flask ➤ Extraction/Reagent Bottles, conical flasks ➤ Mechanical shaker ➤ Pipette ➤ Burette ➤ Funnel with stand 	<ul style="list-style-type: none"> • Class Room • Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



LU2. Perform Procedure	Trainee will be able to learn <ul style="list-style-type: none"> • Weigh specific amount of soil as per requirement • Perform the test as per lab protocol • Calculate as per prescribed formula • Analyze in three replicates • Convert the readings according to standard units • Store unused reagents • Dispose of wastes as required • Clean and store equipment. 	Knowledge based questions: <ul style="list-style-type: none"> • Discuss Soil bulk density. • Describe the benefits of gypsum in soil <u>Practical Activity:</u> <ul style="list-style-type: none"> • Prepare extraction of soil sample as per STM. 	Theory- 8 Hrs. Practical- 12 Hrs. Total- 20 Hrs.	<ul style="list-style-type: none"> ➤ Analytical Balance ➤ Volumetric and conical flask ➤ Extraction/Reagent Bottles, conical flasks ➤ Mechanical shaker ➤ Pipette ➤ Burette ➤ Funnel with stand 	<ul style="list-style-type: none"> • Class Room • Lab Visit
LU3. Perform Quality Control Checks	Trainee will be able to learn <ul style="list-style-type: none"> • Run blank sample accordingly. • Run Laboratory Control samples as per standard. • Perform replicate/re-testing as per lab standards. • Record quality control data as per lab procedure. • Ensure standardization of solution and reagents as per standard method 	Knowledge based questions: <ul style="list-style-type: none"> • Explain the purpose of standardization • Explain the working principle of mechanical shaker. <u>Practical Activity:</u> <ul style="list-style-type: none"> • Run blank sample for standardization. 	Theory- 8 Hrs. Practical- 12 Hrs. Total- 20 Hrs.	<ul style="list-style-type: none"> • Analytical Balance • Volumetric and conical flask • Extraction/Reagent Bottles, conical flasks • Mechanical shaker • Pipette • Burette • Funnel with stand 	<ul style="list-style-type: none"> • Class room • Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



LU4 Record the results/Finalize work	Trainee will be able to learn <ul style="list-style-type: none"> • Calculate as per standard formula. • Submit the results to lab In-charge • Clear and restore work area. 	Knowledge based questions: <ul style="list-style-type: none"> • Explain the formula for estimation of gypsum percentage. <u>Practical Activity:</u> <ul style="list-style-type: none"> • Estimate the percentage saliently in given sample 	Theory- 8 Hrs. Practical- 12 Hrs. Total- 20 Hrs.	<ul style="list-style-type: none"> • Analytical Balance • Volumetric and conical flask • Extraction/Reagent Bottles, conical flasks • Mechanical shaker • Pipette • Burette • Funnel with stand 	<ul style="list-style-type: none"> • Class Room • Lab Visit
LU5 Adopt precautions during work	Trainee will be able to learn <ul style="list-style-type: none"> • Use clean and good quality glassware as per standard method • Always prepare fresh working standards for accurate results. • Ensure safety protocols as per standard method. 	Knowledge based questions: <ul style="list-style-type: none"> • Discuss the safety protocols as per standard method. <u>Practical Activity:</u> <ul style="list-style-type: none"> • Enlist precautionary measure required to conduct test. 	Theory- 4 Hrs. Practical- 6 Hrs. Total- 10 Hrs.	<ul style="list-style-type: none"> • Analytical Balance • Volumetric and conical flask • Extraction/Reagent Bottles, conical flasks • Mechanical shaker • Pipette • Burette • Funnel with stand 	<ul style="list-style-type: none"> • Classroom • Lab Visit



Soil, Water and Fertilizer Testing Lab Technician



Module 10: Generate test report

Objective: This competency standard will provide skills and knowledge related to preparation of test report as per international standards. This will also help in development of communication skills required for preparation of test report and communicate test results to the customer.

Duration: 10 Hrs.

Theory: 4 Hrs.

Practice: 6 Hrs.

Credit Hrs.: 1

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Calculate results	Trainee will be able to learn <ul style="list-style-type: none"> Write entries as per Data log sheet. Enter the data in computer systems Name the parameters accurately and explain abbreviation Use appropriate formula as per procedure Use software as per requirement 	Knowledge based questions: <ul style="list-style-type: none"> Define and describe Basic formatting toolbar of MS Word. Explain the importance of using appropriate units. Explain Footnotes. Describe the use of MS Word and Excel for reporting test results. 	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none"> Register Computer Calculator 	<ul style="list-style-type: none"> Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> Transfer the output in Performa as per results of each test 	<u>Practical Activity:</u> <ul style="list-style-type: none"> Prepare data chart on excel sheet 			
LU2. Prepare report	Trainee will be able to learn <ul style="list-style-type: none"> Cross check the results Use proper unit of expression for results Provide reference range of each parameter as per requirement Specify Lab environment as per test report format Mention sample ID and description as per test report format Mention test method reference as test report format Report Conformity statement as per lab policy 	Knowledge based questions: <ul style="list-style-type: none"> Define sample ID. Explain the Test report format Describe the reference standard range. Explain sample description. Explain significance of traceability of results. <u>Practical Activity:</u> <ul style="list-style-type: none"> Prepare a results report. 	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none"> Printer Register Computer Calculator 	<ul style="list-style-type: none"> Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none">• Ensure traceability to test sample, sampling details, lab detail and analyst as per lab policy.• Date of test performed as per test report Format.• Sign the test report.				
--	---	--	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



Module 11: Ensure Test Quality

Objective: This competency standard will provide skills and knowledge related to preparation of test report as per international standards. This will also help in development of communication skills required for preparation of test report and communicate test results to the customer.

Duration: 20 Hrs.

Theory: 8 Hrs.

Practice: 12 Hrs.

Credit Hrs.: 2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Supervise test activity	Trainee will be able to learn <ul style="list-style-type: none"> Ensure required temperature of the test as per test method. Ensure the placement of all the equipment and instruments as per standard Ensure the proper functioning of equipment Ensure the availability of all the stock and working solutions Ensure the quality assurance of all stock and working 	Knowledge based questions: <ul style="list-style-type: none"> Describe the impact of temperature and humidity on performance of equipment. Explain the importance of lab manuals Explain laboratory layouts. <u>Practical Activity:</u> <ul style="list-style-type: none"> Prepare instrument logbook. 	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none"> Printer Register Computer Calculator Thermometer Thermo-hygrometer Equipment manual Chemicals as per quality assurance plan Apparatus as per quality assurance plan 	<ul style="list-style-type: none"> Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<p>solutions</p> <ul style="list-style-type: none"> Implement safety parameters applicable for each test. 				
LU2. Supervise Subordinates	Trainee will be able to learn <ul style="list-style-type: none"> Assign task to subordinates as per requirement. Train subordinates as per lab training plan. Evaluate subordinated for task performed as per lab evaluation criteria, Monitor the assigned activities as per requirement. Prepare related records of evaluation and monitoring as per lab procedure. Submit the records to the supervisor. 	Knowledge based questions: <ul style="list-style-type: none"> Explain training plan for lab staff. Explain JDs for working staff. Discuss the importance of daily performance report, <u>Practical Activity:</u> <ul style="list-style-type: none"> Prepare evaluation Performa for sub-ordinates. 	Theory- 4 Hrs. Practical- 6 Hrs. Total- 10 Hrs.	<ul style="list-style-type: none"> Printer Register Computer Calculator 	<ul style="list-style-type: none"> Classroom



Soil, Water and Fertilizer Testing Lab Technician



<p>LU3.</p> <p>Perform quality Check</p>	<p>Trainee will be able to learn:</p> <ul style="list-style-type: none"> Plan activity as per lab quality assurance plan Perform Quality assurance activity as per plan Check the acceptance criteria as per lab standard protocol. Employ statistical techniques (relative standard deviation, standard deviation, average/mean) as per lab procedure. Prepare quality control charts following lab procedures. Report deviations or outliers observed to the supervisor. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Define Relative standard deviation. Explain average and mean value. Describe uncertainty. Explain acceptance criteria as per lab standard protocol. <p><u>Practical Activity:</u></p> <p>Calculate following from given data</p> <ul style="list-style-type: none"> ➤ standard deviation ➤ Uncertainty 	<p>Theory- 2 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total- 5 Hrs.</p>	<ul style="list-style-type: none"> Printer Register Computer Calculator Thermometer Thermo-hygrometer Equipment manual Chemicals as per quality assurance plan Apparatus as per quality assurance plan 	<ul style="list-style-type: none"> Classroom
--	---	---	--	---	---



Soil, Water and Fertilizer Testing Lab Technician



Level 5 (Generic Competencies)

Module 1: Develop Entrepreneurial Skills

Objective:

After the completion of this competency standard, the Trainee will be expected to develop a business plan, collect information regarding funding sources, develop a marketing plan and develop basic business communication skills. Trainee's underpinning knowledge regarding entrepreneurial skills will be sufficient to provide you the basis for your work.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Develop a business plan	Trainee will be able to: <ul style="list-style-type: none">Conduct a market survey to collect following information:<ul style="list-style-type: none">i. Customer /demandii. Tools, equipment, machinery and furniture with rates	<ul style="list-style-type: none">Main elements of business planFilling the business plan formatEnlist specific business terms used in the industry	Theory- 3 Hrs. Practical- 3 Hrs. Total – 6 Hrs.	<ul style="list-style-type: none">InternetLaptop/ComputerWhite boardProjector screenMultimedia projector	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> iii. Raw material iv. Supplier v. Credit / funding sources vi. Marketing strategy vii. Market trends viii. Overall expenses ix. Profit margin <ul style="list-style-type: none"> • Select the best option in terms of cost, service, quality, sales, profit margin, overall expenses • Compile the information collected through the market survey, in the business plan format 	<ul style="list-style-type: none"> • Describe 7Cs of business communication 			
LU2. Collect information regarding funding sources	Trainee will be able to: <ul style="list-style-type: none"> • Identify the available funding sources based on their terms and conditions, maximum loan limit, payback time, interest rate • Choose the best available option according to investment requirement • Prepare documents according to the loan agreement requirement • Include the information of funding sources in the business plan 	<ul style="list-style-type: none"> • Enlist the available funding sources • Explain how to get loan to start a new business • Explain market survey and its tools e.g.: questionnaire, interview, observation etc 	Theory- 3 Hrs. Practical- 3 Hrs. Total – 6 Hrs.	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



LU3. Develop a marketing plan	Trainee will be able to: <ul style="list-style-type: none"> • Make a marketing plan for the business including product, price, placement, promotion, people, packaging and positioning • Include the information of marketing plan in the business plan 	<ul style="list-style-type: none"> • 7ps of marketing including product, price, placement, promotion, people, packaging and positioning 	Theory- 3 Hrs. Practical- 6 Hrs. Total – 9 Hrs.	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	Classroom
LU4. Develop basic business communication skills	Trainee will be able to: <ul style="list-style-type: none"> • Communicate with internal customers e.g.: labor, partners and external customers e.g.: suppliers, customers etc., using effective communication skills • Use different modes of communication to communicate internally and externally e.g.: presentation, speaking, writing, listening, visual representation, reading etc. • Use specific business terms used in the market 	<ul style="list-style-type: none"> • Description of the market trends for specific product offering • Different modes of communication and their application in the industry 	Theory- 3 Hrs. Practical- 6 Hrs. Total – 9 Hrs.	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



Module 2: Maintain Business Resources

Objective:

After the completion of this competency standard, the Trainee will be able to determine, administer and maintain resources and equipment to complete a variety of tasks. It applies to individuals who are skilled operators and apply a broad range of competencies in various work contexts. They may exercise discretion and judgment using appropriate theoretical knowledge of business resources and their basic maintenance to provide technical advice and support to a team.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Advise on resource requirements	<p>Trainee will be able to:</p> <ul style="list-style-type: none">Calculate estimates of future and present business resource needs in accordance with organizational requirementsEnsure advice is clear, concise and relevant to achieve organizational requirements.	Knowledge based questions:	<p>Theory- 4 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 10 Hrs.</p>	<ul style="list-style-type: none">InternetLaptop/ComputerWhite boardProjector screenMultimedia projector	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> • Provide information on the most economical and effective choice of equipment, materials and suppliers. • Identify resource shortages and possible impact on operations 				
LU2. Monitor resource usage and maintenance	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Ensure resource handling is in accordance with established organizational requirements including occupational health and safety requirements. • Use business technology to monitor and identify the effective use of resources. • Use consultation with individuals and teams to facilitate effective decision making on the appropriate allocation of resources. • Identify and adhere to relevant policies regarding resource use in the performance of operational tasks. 	Knowledge based questions:	<p>Theory- 4 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 10 Hrs.</p>	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector • 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> Routinely monitor and compare resource usage with estimated requirements in budget plans 				
LU3. Acquire resources	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Ensure acquisition and storage of resources is in accordance with organizational requirements, is cost effective, and consistent with organizational timelines. Acquire resources within available timelines to meet identified requirements. Review resource acquisition processes to identify improvements in future resource acquisitions 	Knowledge based questions:	<p>Theory- 4 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 10 Hrs.</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



Module 3: Develop A Sales Plan

Objective:

After the completion of this competency standard, the Trainee will be able to develop a sales plan for a product or service for a team covering a specified sales territory based on strategic objectives and in accordance with established performance targets. It applies to individuals working in a supervisory or managerial sales role who develop a sales plan for a product or service.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Identify organizational strategic direction	Trainee will be able to: <ul style="list-style-type: none"> Obtain and analyze assessment of market needs and strategic planning documents Review previous sales performance and successful approaches to identify factors affecting performance Analyze information on 	Knowledge based questions: <ul style="list-style-type: none"> Assessment of market needs and strategic planning documents preparation Knowledge of business opportunities, customer profiles and decision 	Theory- 2 Hrs. Practical- 3 Hrs. Total – 5 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	market needs, new opportunities, customer profiles and requirements as a basis for decision making	making			
LU2. Establish performance targets	Trainee will be able to: <ul style="list-style-type: none"> Determine practical and achievable sales targets Establish realistic time lines for achieving targets Determine measures to allow for monitoring of performance Ensure objectives of the sales plan and style of the campaign are consistent with organizational strategic objectives and corporate image 	Knowledge based questions: <ul style="list-style-type: none"> tatistical techniques for analyzing sales and market trends 	Theory- 2 Hrs. Practical- 3 Hrs. Total – 5 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom
LU3. Develop a sales plan for a product	Trainee will be able to: <ul style="list-style-type: none"> Determine approaches to be used to meet sales objectives Identify additional expertise requirements and allocate budgetary resources 	Knowledge based questions: <ul style="list-style-type: none"> Principles and techniques for selling Sources of internal and external information Identification of organizational strategic 	Theory- 3 Hrs. Practical- 6 Hrs. Total – 9 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<p>accordingly</p> <ul style="list-style-type: none"> Identify risks and develop risk controls Develop advertising and promotional strategy for product Identify appropriate distribution channels for product Prepare a budget for the sales plan Present documented sales plan to appropriate personnel for approval 	<p>direction and developing a product sales plan</p> <ul style="list-style-type: none"> Preparation of sales plan and its approval 			
LU4. Identify support requirements	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Identify and acquire staff resources to implement sales plan Develop an appropriate selling approach Train staff in the selling approach selected Develop and assess staff knowledge of product to be sold 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Resources requirement for sales plan 	<p>Theory- 2 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total – 5 Hrs.</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



LU5. Monitor and review sales plan	Trainee will be able to: <ul style="list-style-type: none">• Monitor implementation of the sales plan• Record data measuring performance versus sales targets• Make adjustments to sales plan as required to ensure required results are obtained	Knowledge based questions: <ul style="list-style-type: none">• Principles, monitoring and techniques for selling Sources of internal and external information	Theory- 3 Hrs. Practical- 3 Hrs. Total – 6 Hrs.	<ul style="list-style-type: none">• Internet• Laptop/Computer• White board• Projector screen• Multimedia projector	Classroom
---	--	--	--	--	-----------



Soil, Water and Fertilizer Testing Lab Technician



Module 4: Plan And Implement Business-To-Business Marketing

Objective:

After the completion of this competency standard, the Trainee will be able to plan and implement business-to-business (B2B) marketing. It applies to individuals who work in a supervisory capacity in a team environment, who possess a sound theoretical knowledge base and demonstrate a range of managerial skills to ensure business activities are conducted effectively. In this role, individuals may work in small, medium or large enterprises across a variety of industries.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Identify and evaluate business -to-business marketing strategies	Trainee will be able to: <ul style="list-style-type: none">Identify B2B markets in an industry contextResearch characteristics of business markets in an industry contextIdentify and analyze factors influencing business buyers in an industry contextAnalyze the business buying	Knowledge based questions: <ul style="list-style-type: none">Identification of Business to Business markets	Theory- 3 Hrs. Practical- 3 Hrs. Total – 6 Hrs.	<ul style="list-style-type: none">InternetLaptop/ComputerWhite boardProjector screenMultimedia projector	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<p>process and its implications in the industry context</p> <ul style="list-style-type: none"> • Research and analyze a range of B2B marketing strategies appropriate for the organization • Identify key personnel in buying decision process in the organization s business markets 				
LU2. Select business-to business marketing strategies	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Analyze trends within business markets and identify B2B marketing opportunities for the organization • Identify and analyze success of the organization s previous B2B marketing strategies • Select most appropriate B2B marketing strategies and activities that fit with organization s strategic & marketing plans 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Preparation of business to business strategies 	<p>Theory- 3 Hrs. Practical- 6 Hrs. Total – 9 Hrs.</p>	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector • 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



<p>LU3.</p> <p>Plan and develop business-to-business marketing activities</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Record B2B marketing objectives and purpose Calculate costs of B2B marketing activities with assistance of appropriate personnel Select methods to report and measure effectiveness of B2B marketing activities Assign responsibilities to team members for B2B marketing activities Record B2B marketing plan and present to relevant stakeholders Assemble required resources to implement B2B marketing plan 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Plan the business to business strategies 	<p>Theory- 3 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total – 9 Hrs.</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector • 	<p>Classroom</p>
<p>LU4. Implement and monitor business-to-business marketing plan</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Schedule work on each B2B marketing campaign element, according to lead times required and marketing plan Brief staff and suppliers on their budgets, timelines, roles and responsibilities, and legal 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Trends in B2B marketing, corporate sector and business sector and preparation of plans 	<p>Theory- 3 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total – 6 Hrs.</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector • 	<p>Classroom</p>



Soil, Water and Fertilizer Testing Lab Technician



	<p>and ethical requirements</p> <ul style="list-style-type: none">• Plan implementation of B2B marketing activities according to marketing plan• Identify & use evaluation criteria and evaluation methods to determine effectiveness of marketing plan• Analyze success indicators of B2B marketing plan and record performance according to organizational reporting requirements				
--	---	--	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



Module 5: Address Customer Needs

Objective:

After the completion of this competency standard, the Trainee will be able to manage an ongoing relationship with a customer over a period of time. This includes helping customers articulate their needs and managing networks to ensure customer needs are addressed. It applies to individuals who are expected to have detailed product knowledge in order to recommend customized solutions. In this role, individuals would be expected to apply organizational procedures and be aware of, and apply as appropriate, broader factors involving ethics, industry practice and relevant government policies and regulations.

Duration: 20 Hours

Theory: 8 Hours

Practice: 12 Hours

Credit Hours: 2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Assist customer to articulate needs	Trainee will be able to: <ul style="list-style-type: none">Ensure customer needs are fully explored, understood and agreedExplain and match available services and products to customer needsIdentify and communicate rights and responsibilities of	Knowledge based questions: <ul style="list-style-type: none">Explain organizational procedures and standards for establishing and maintaining customer service relationships.Explain consumer rights	Theory- 2 Hrs. Practical- 3 Hrs. Total – 5 Hrs.	<ul style="list-style-type: none">InternetLaptop/ComputerWhite boardProjector screenMultimedia projector	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	customers to the customer as appropriate	and responsibilities			
LU2. Satisfy complex customer needs	Trainee will be able to: <ul style="list-style-type: none"> • Explain possibilities for meeting customer needs • Assist customers to evaluate service and/or product options to satisfy their needs • Determine and prioritize preferred actions • Identify potential areas of difficulty in customer service delivery and take appropriate actions in a positive manner 	<ul style="list-style-type: none"> • Describe ways to establish effective regular communication with customers • Variations within a limited product and service range. 	Theory- 2 Hrs. Practical- 3 Hrs. Total – 5 Hrs.	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	Classroom
LU3. Manage networks to ensure customer needs are addressed	Trainee will be able to: <ul style="list-style-type: none"> • Establish effective regular communication with customers • Establish, maintain and expand relevant networks to ensure appropriate referral of customers to products and services from 	<ul style="list-style-type: none"> • Outline details of products or services including with reference to possible alternative products and services 	Theory- 2 Hrs. Practical- 3 Hrs. Total – 5 Hrs.	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<p>within and outside the organization</p> <ul style="list-style-type: none"> • Ensure procedures are in place to ensure that decisions about targeting of customer services are based on up-to-date information about the customer and the products and services available • Ensure procedures are put in place to ensure that referrals are based on the matching of the assessment of customer needs and availability of products and services • Maintain records of customer interaction in accordance with organizational procedures 				
LU4. Convert customer enquiries into sales	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Use information provided by customers or accessed from customer relationship management (CRM) system to identify any need 	<ul style="list-style-type: none"> • Organizational standards for maintaining customer relationships to convert convincing sales pitches to customers need 	<p>Theory- 2 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total – 5 Hrs.</p>	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none">• Identify suitable products /services to meet needs• Make convincing sales pitches to customers following standard scripts• Handle customer queries, objections and rebuttals following standard scripts• Adapt your approach and style to customer preferences, within limits of your competence and authority• Refer issues outside your area of competence and authority to appropriate people, following your organization's procedures• Identify and act on opportunities to up-sell or cross-sell other products/services to customers• Confirm customer wishes and needs in order to close sales• Obtain required financial information from customers, following your organization's procedures				
--	---	--	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none">• Complete your organization's post-sales procedures in order to complete/fulfill sales• Comply with relevant standards, policies, procedures and guidelines when converting customer enquiries into sales				
--	---	--	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



Module 6: Solve Problems Which Jeopardize Safety And Security

Objective:

After the completion of this competency standard, the Trainee will be able to understand the complex negotiation in critical incidents and the development of strategic responses designed to resolve threatening incidents.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Identify a problem	Trainee will be able to: <ul style="list-style-type: none">Form a problem statement and analyze root cause.Take initiative in tackling problems rather than relying solely on directivesFollow logic steps in understanding root cause and analyzing potential solutions.	<ul style="list-style-type: none">Explain organization's policies, guidelines and procedures related to control and surveillance, safety and preventing and responding to incidents and breaches of orders covered in the range of variables.	Theory- 3 Hrs. Practical- 3 Hrs. Total- 6 Hrs.	<ul style="list-style-type: none">InternetLaptop/ComputerWhite boardProjector screenMultimedia projector	Classroom



Soil, Water and Fertilizer Testing Lab Technician



<p>LU2. Determine strategies for a required solution</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Analyze all aspects of the incident for degree of hazard, priorities, optional outcomes and appropriate strategies Analyze and determine strategies and priorities on the incident sought from a range of sources Assess long term objectives against resources and priorities Apply a range of communication techniques to make and maintain contact with the key people Provide clear and factual information to enable an honest and realistic assessment of the interests of the key people and their positions Resolve the conflict and express their likely consequences clearly and do an analysis of the benefits Reassess points of 	<ul style="list-style-type: none"> A person who demonstrates competency in this unit must be able to provide evidence of the ability to resolve problems which jeopardize safety and security. 	<p>Theory- 3 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total- 6 Hrs.</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	<p>Classroom</p>
---	---	---	--	--	------------------



Soil, Water and Fertilizer Testing Lab Technician



	disagreements for common positive Positions				
LU3. Coordinate support services	Trainee will be able to: <ul style="list-style-type: none"> Assess the need for support services in terms of the determined strategies and priorities Negotiate the resources of support services according to established procedures and availability Provide information on strategies to support services and maintain the communication Delegate roles and responsibilities according to expertise and resources 	<ul style="list-style-type: none"> Explain organization's management and accountability systems Outline the guidelines for use of equipment and technology Explain code of conduct 	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom
LU4. Restore order	Trainee will be able to: <ul style="list-style-type: none"> Assess the incidents for degree of risk and take appropriate action to reduce and remove the impact of the incident and 	<ul style="list-style-type: none"> Describe teamwork principles and strategies Outline the principles of effective communication 	Theory- 3 Hrs. Practical- 6 Hrs. Total- 9 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none">• restore order• Take action designed to minimize risk and the preserve the safety and security of all involved• Take action to prevent the escalation of the incident appropriate to the circumstances and agreed procedures.• Carry out the use of force for the restoration of control and the maintenance of security in the least restrictive manner.• Complete reports accurately and clearly provided to the appropriate authority promptly• Review, evaluate and analyze the incident and the organizational response to it and report it promptly and accurately.•				
--	---	--	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



<p>LU5. Provide leadership. direction and guidance to the work group</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Link between the function of the group and the goals of the organization • Participate in decision making routinely to develop, implement and review work of the group and to allocate responsibilities where appropriate • Give opportunities and encouragement to others to develop new and innovative work practices and strategies • Identify conflict and resolve with minimum disruption to work group function • Provide staff with the support and supervision necessary to perform work safely and without risk to health • Allocate tasks within the competence of staff and support with appropriate authority, autonomy and training • Supervise appropriately the 	<ul style="list-style-type: none"> • Integration of employability skills with workplace tasks and job roles • Verification of competency to be transferred to other circumstances and environments 	<p>Theory- 1 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total- 4 Hrs.</p>	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	<p>Classroom</p>
---	---	--	--	--	------------------



Soil, Water and Fertilizer Testing Lab Technician



	changing priorities and situations and takes into account the different needs of individuals and the requirements of the task				
--	---	--	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



Module 7: Apply problem solving techniques in the workplace using critical thinking

Objective: After the completion of this competency standard, the Trainee will be able to apply the process of problem solving for problems beyond those associated directly with the process unit.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Analyze the problem	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Evaluate issues/concerns are evaluated based on data gathered. Identify possible causes of problem are identified within the area of responsibility as based on experience and the use of problem solving tools/analytical techniques. Develop possible cause statements based on 	<ul style="list-style-type: none"> Explain Analytical skills and broad knowledge of diagnostic tools Explain broad knowledge of the client business domain Elaborate broad understanding of organizational systems and functions Outline communication skills according to the type of audience Explain the methods of questioning and active 	<p>Theory- 3 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total- 6 Hrs.</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<p>findings.</p> <ul style="list-style-type: none"> • Use analogies to support reasoning. • Identify cause and effects are identified based on the criteria or information provided to support reasoning. 	<p>listening employed to clarify general information</p>			
<p>LU2. Identify possible solutions</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Consider all possible options for solution of the problem in accordance with safety and operating procedures. • Determine strengths and weaknesses of possible options. • Take corrective action to solve the problem and determine its possible future causes. • Analyze past experience • Provide samples to support generalization. • Implement simulations as needed. 	<ul style="list-style-type: none"> • Describe the ways to develop critical thinking • Explain methods and techniques for decision making within a limited range of options • Describe general customer service skills 	<p>Theory- 3 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total- 6 Hrs.</p>	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	<p>Classroom</p>



Soil, Water and Fertilizer Testing Lab Technician



LU3. Recommend solution to higher management	Trainee will be able to: <ul style="list-style-type: none"> • Prepare report or documentation. • Present recommendations to appropriate personnel. • Follow up recommendations, if required. 	<ul style="list-style-type: none"> • Explain the ways to improve teamwork in reference to personal responsibility 	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	Classroom
LU4. Implement solution	Trainee will be able to: <ul style="list-style-type: none"> • Identify measurable objectives • Identify resource needs • Prepare timelines in accordance with plan. 	<ul style="list-style-type: none"> • Develop teams and individuals and ask for individual feedback 	Theory- 3 Hrs. Practical- 6 Hrs. Total- 9 Hrs.	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	Classroom
LU5. Evaluate / monitor results and outcome	Trainee will be able to: <ul style="list-style-type: none"> • Identify processes and improvements based on evaluative assessment of problem. • Prepare recommendations and submit to superiors 	<ul style="list-style-type: none"> • The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other situations 	Theory- 1 Hr Practical- 3 Hrs. Total- 4 Hrs.	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



Module 8: Manage Personal Finances

Objective:

After the completion of this competency standard, the Trainee will be able to develop, implement and monitor a personal budget in order to plan regular savings and manage debt effectively.

Duration: 20 Hours

Theory: 8 Hours

Practice: 12 Hours

Credit Hours: 2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Develop a personal budget	Trainee will be able to: <ul style="list-style-type: none">Calculate current living expenses using available information to prepare a personal budget.Keep a record of all income and expenses for a short period of time to help estimate ongoing expenses.Subtract total expenses from total income to determine a surplus or deficit budget for the specified period.	<ul style="list-style-type: none">Preparing cash flow statementBasic concepts of Time value of moneyUnderstanding of current and fixed assetsUnderstanding of elements of equity and liabilities (long term and short term)Identification of available	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none">InternetLaptop/ComputerWhite boardProjector screenMultimedia projector	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> Find reasons for a deficit budget and ways to reduce expenditure identified. Identify ways to increase income, if possible 	financial resources <ul style="list-style-type: none"> Step by step budget plan preparation Budget review techniques 			
LU2. Develop longer term personal budget	Trainee will be able to: <ul style="list-style-type: none"> Analyze income and expenditure and set longer term personal, work and financial goals. Develop a longer-term budget based on the outcomes of short-term budgeting, and adjust to meet living, work and future career requirements. Identify obstacles that might affect finances such as job loss, sickness or unexpected expenses contingency savings Formulate a regular savings plan based on budget, using secure savings products and services. Monitor expenditure against budget and identify areas of 	<ul style="list-style-type: none"> Develop a personal budget based on analysis of expenditure and income Monitor expenditure for a period of up to 2 weeks. 	Theory- 3 Hrs. Practical- 6 Hrs. Total- 9 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	possible expenditure saving				
LU3. Identify ways to maximize future finances	Trainee will be able to: <ul style="list-style-type: none"> Determine sources and ways to maximize personal income, including from work, investments or available government payments/allowances. Get further education or training to maintain or improve future income. Identify the need for debt to finance living and other expenses, and determine the appropriate levels of debt and repayment. Consolidate existing debt, where possible, to minimize interest costs and fees. Seek professional money management services, where available, to ensure financial plans are 	<ul style="list-style-type: none"> Formulate goals and identify financial contingency plans 	Theory- 3 Hrs. Practical- 3 Hrs. Total- 6 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	effective and achievable				
--	--------------------------	--	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



Module 9: Coordinate a Work Team

Objective:

After the completion of this competency standard, the Trainee will be able to achieve operational outcomes and effective working relationships through managing and developing individuals and teams.

Duration: 20 Hours

Theory: 8 Hours

Practice: 12 Hours

Credit Hours: 2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Develop and maintain a cooperative work group	Trainee will be able to: <ul style="list-style-type: none"> Work contributions and suggestions from staff are continually sought and encouraged Contributions to work group operations are acknowledged and suggestions are dealt with constructively Develop staff skills according to work requirements 	<ul style="list-style-type: none"> Explain the principles of effective team operation Explain the principles of human resource management Describe the training delivery processes in the workplace 	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> Implement new work practices Address conflict between staff members in accordance with current personnel practices. 				
LU2. Communicate objectives and required standards	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Inform the staff of the objectives and standards required Commit to objectives and standards Practices of safe, fair and participative work principals are and promote to staff 	<ul style="list-style-type: none"> Ability to coordinate a work team Evidence of integration of employability skills with workplace tasks and job roles 	<p>Theory- 2 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total- 5 Hrs.</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom
LU3. Provide feedback on performance	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Give constructive feedback on all aspects of work performance provided to individuals and team Access and address performance in a fair and timely manner in accordance with relevant guidelines, procedures and natural justice 	<ul style="list-style-type: none"> Outline the industry assessment guidelines 	<p>Theory- 1 Hr</p> <p>Total- 1 Hr</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



<p>LU4. Support and participate in development activities</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Assess training needs of all staff, implemented and promoted Devise an action plan to meet individual and group training and development needs is collaboratively developed, agreed to and implemented Identify specific training needs of individuals Encourage staff in applying skills and knowledge in the workplace Provide training to the required standard on the job Support and encourage staff to attend training courses and to take up other development opportunities. 	<ul style="list-style-type: none"> Employee feedback development procedures Employee performance and development activities feedback Mechanism for taking actions after the performance appraisals 	<p>Theory- 1 Hr</p> <p>Practical- 3 Hrs.</p> <p>Total- 4 Hrs.</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	<p>Classroom</p>
<p>LU5. Provide leadership. direction and guidance to the work group</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Link between the function of the group and the goals of the organization Participate in decision 	<ul style="list-style-type: none"> Designing the training modules Scheduling of trainings & allocation of trainers Allocation of supportive resources 	<p>Theory- 2 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total- 5 Hrs.</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	<p>Classroom</p>



Soil, Water and Fertilizer Testing Lab Technician



	<p>making routinely to develop, implement and review work of the group and to allocate responsibilities where appropriate</p> <ul style="list-style-type: none">• Give opportunities and encouragement to others to develop new and innovative work practices and strategies• Identify conflict and resolve with minimum disruption to work group function• Provide staff with the support and supervision necessary to perform work safely and without risk to health• Allocate tasks within the competence of staff and support with appropriate authority, autonomy and training• Supervise appropriately the changing priorities and situations and takes into account the different needs of individuals and the requirements of			<ul style="list-style-type: none">•	
--	---	--	--	---	--



Soil, Water and Fertilizer Testing Lab Technician



	the task				
--	----------	--	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



Module 10: Lead Small Teams

Objective:

After the completion of this competency standard, the Trainee will be able to lead small teams including setting and maintaining team and individual performance standards.

Duration: 20 Hours

Theory: 8 Hours

Practice: 12 Hours

Credit Hours: 2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Facilitate team development	Trainee will be able to: <ul style="list-style-type: none"> Identify work requirements, standards and purpose to team members. Assist team to develop objectives, targets and key performance indicators relevant its purpose and workplace goals. Allocate duties regard to the skills required to properly 	<ul style="list-style-type: none"> Explain team dynamics and facilitation processes Describe methods of monitoring performance Outline the relevant legal requirements. Outline strategies for dealing effectively with team member complaints or grievances 	Theory- 3 Hrs. Practical- 3 Hrs. Total- 6 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<p>undertake the assigned task and according to company policy.</p> <ul style="list-style-type: none"> Identify roles, responsibilities and expectations of each team member. Disseminate and discuss performance expectations to individual team members. 				
LU2. Motivate and build the team	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Develop positive and constructive relationships with and between team members Facilitate team communication processes Involve team members in the process of examining risks and options and making decisions, to ensure acceptance and support. Encourage individual and team efforts and contributions. Strengths and weaknesses of team members are 	<ul style="list-style-type: none"> A person who demonstrates competency in this unit must be able to provide evidence of the ability to lead small teams. State workplace policies and procedures 	<p>Theory- 3 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 9 Hrs.</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<p>determined and sharing of work tasks is promoted to up skill team members.</p> <ul style="list-style-type: none"> Recognize team members' queries and discuss and deal with it. 				
<p>LU3. Facilitate and monitor team effectiveness</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Monitor the implementation of work plan and team and individual performance against agreed strategies, targets and standards, according to workplace policies and procedures. Monitor performance against defined performance criteria and/or assignment instructions and corrective action taken if required. Support team in identifying and resolving problems that may impede performance and to suggest improvements in team Performance. Consult team members in 	<ul style="list-style-type: none"> Explain conflict resolution techniques Explain management styles Evidence of integration of employability skills with workplace tasks and job roles and verify competency is able to be transfer 	<p>Theory- 2 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total- 5 Hrs.</p>	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	<p>Classroom</p>



Soil, Water and Fertilizer Testing Lab Technician



	<p>any review and revision of team objectives and goals.</p> <ul style="list-style-type: none">• Address performance issues which cannot be rectified within the team to appropriate personnel according to employer policy.• Refer concerns of a team and individual are referred to next level of management or appropriate specialist and conduct negotiations on their behalf.• Keep team members inform of any changes in the priority allocated to assignments, or tasks which might impact on client/customer needs and satisfaction.• Monitor team operations to ensure that internal or external employer/client needs and requirements are met.• Provide follow-up communication on all issues affecting the team				
--	---	--	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none">• Conduct team meetings to review work operations and address issues according to workplace policies and procedures.• Support team in identifying and resolving problems that may impede performance and to suggest improvements in team performance.• Consult team members in any review and revision of team objectives and goals.• Raise any inappropriate values and standards exhibited in the workplace with the person concerned.				
--	---	--	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



Module 11: Manage Human Resource Services

Objective: After the completion of this competency standard, the Trainee will be able to plan, manage and evaluate delivery of human resource services, integrating business ethics. It applies to individuals with responsibility for coordinating a range of human resource services across an organization. They may have staff reporting to them.

Duration: 20 Hours

Theory: 8 Hours

Practice: 12 Hours

Credit Hours: 2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Determine strategies for delivery of human resource services	Trainee will be able to: <ul style="list-style-type: none"> Analyze business strategy and operational plans to determine human resource requirements. Review external business environment and likely impact on organization's human resource requirements. 	<ul style="list-style-type: none"> Identify the key provisions of legal and compliance requirements that apply to managing human resources Summarize the organization's code of conduct 	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> • Consult line and senior managers to identify human resource needs in their areas. • Review organization's requirements for diversity in the workforce. • Develop options for delivery of human resource services that comply with legislative requirements, organizational policies and business goals. • Develop and agree on strategies and action plans for delivery of human resource services. • Agree and document roles and responsibilities of human resource team, line managers, and external contractors 				
LU2. Manage the delivery of human resource services	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Develop and communicate information about human resource strategies and services to internal and external stakeholders. 	<ul style="list-style-type: none"> • Fundamentals of recruitment and selection process i.e. searching, screening, evaluation and control • Types of recruitment processes 	<p>Theory- 2 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total- 5 Hrs.</p>	<ul style="list-style-type: none"> • Internet • Laptop/Computer • White board • Projector screen • Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none"> • Develop and negotiate service agreements between the human resource team, service providers and client groups. • Document and communicate service specifications, performance standards and timeframes. • Document and communicate service specifications, performance standards and timeframes. • Agree on, and arrange monitoring of quality assurance processes. • Ensure that services are delivered by appropriate providers, according to service agreements and operational plans. • Identify and rectify underperformance of human resource team or service providers. • Identify appropriate return on investment of providing human resource services. 	as per business requirement			
--	--	-----------------------------	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



LU3. Evaluate human resource service delivery	Trainee will be able to: <ul style="list-style-type: none"> Establish systems for gathering and storing information needed to provide human resource services. Survey clients to determine level of satisfaction. Analyze feedback and surveys and recommend changes to service delivery. Capture ongoing client feedback for the review processes. Obtain approvals to variations in service delivery from appropriate managers. Support agreed change processes across the organization. 	<ul style="list-style-type: none"> Explain human resource strategies and planning processes and their relationship to business and operational plans 	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom
LU4. Manage integration of business ethics in human resource practices	Trainee will be able to: <ul style="list-style-type: none"> Ensure personal behavior is consistently ethical and reflects values of the organization. 	<ul style="list-style-type: none"> Describe performance and contract management Explain how feedback is used to modify the delivery of human resources. 	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none"> Internet Laptop/Computer White board Projector screen Multimedia projector 	Classroom



Soil, Water and Fertilizer Testing Lab Technician



	<ul style="list-style-type: none">• Ensure code of conduct is observed across the organization, and its expectations are incorporated in human resource policies and practices.• Observe confidentiality requirements in dealing with all human resource information.• Deal promptly with unethical behavior.• Ensure all persons responsible for human resource functions understand requirements regarding their ethical behavior.				
--	---	--	--	--	--



Soil, Water and Fertilizer Testing Lab Technician



- **List of Tool & Equipment:**

- Buckets
- Cardboard box
- First Aid Kit
- Flow meter
- GPS device
- Hygrometer
- Ice box
- Marker
- Measuring tape
- Metal ring
- Personal protective equipment (PPE)
- Plastic bags
- Preservatives
- Sacks
- Sampling bottles
- Shovel
- Stainless steel Auger
- Sterilized containers



Soil, Water and Fertilizer Testing Lab Technician



- Stop watch
- Tags for labelling
- Thermometer
- Thread
- Un-galvanized Auger

Processing Tools

- Crusher (Manual and mechanical)
- Different mesh sieves
- Pestle and mortar
- Sample Storage containers
- Sample Splitter
- Spatula
- Registers
- Filtration assembly
- Labelling materials
- Trowel
- Oven
- Vacuum extraction pump

Analytical Tools and glass wares



Soil, Water and Fertilizer Testing Lab Technician



- Beaker
- Burette
- China Dish
- Conical flask
- Crucible
- Cylinder (From 10 ml to 1L)
- Dropper
- Filter Paper
- Funnel
- Indicator dropper
- Measuring Flask
- Petri dishes
- Pipette
- PPE
- Stirring rod
- Test Tube racks
- Test Tubes
- Tong
- Wash bottles
- Wash dishes



Soil, Water and Fertilizer Testing Lab Technician



Equipment

- Atomic Absorption spectrophotometer
- Analytical Balance
- Auto clave
- Block digestion
- Dispenser
- EC meter
- Exhaust hood
- Flame Photo meter
- Flow injection analyser
- Freezer
- Hot Plate
- Hot water bath tub
- Hydrometer
- Incubator
- Kjeldahl Unit
- Laminar flow
- Muffle Furnace



Soil, Water and Fertilizer Testing Lab Technician



- Oven
- PH meter
- Reciprocating Shakers
- Refrigerator
- Shaker
- Shaker
- Spectro Photometer
- Vortex mixer
- Water Distillation Unit

PPE

- Lab coat
- Goggle
- Gloves
- Dust mask
- Full face shield
- Safety Shoes



Soil, Water and Fertilizer Testing Lab Technician



11. Members of the Curriculum Development Committee

S#	Name	Designation
1	Mr. Muhammad Saeed Ahmed	Agriculture Officer, UVAS Pattoki
2	Dr. Asma Saeed	Principal Scientific Officer, PCSIR Labs. Complex Lahore
3	Dr. Amina Mumtaz	Sr. Scientific Officer, PCSIR Labs. Complex Lahore
4	Dr. Naeem Abbas	Sr. Scientific Officer, PCSIR Labs. Complex Lahore
5	Ms. Saadia Syed	DACUM Expert GCTW, Lahore
6	Ms. Mahnoor Atique	MPhil Scholar, UET Lahore



Soil, Water and Fertilizer Testing Lab Technician



7	Ms. Iqra Haider Khan	PhD Scholar, PU
8	Ms. Shagufta Perveen	PhD Scholar, PU
9	Engr. Aijaz Ahmed Zia	DACUM Facilitator
10	Mr. Muhammad Yasir	Deputy Director/ Coordinator – (Skills Standards and Curricula) NAVTTC HQ

12. Members of the Qualification Validation Committee

S#	Name	Designation
1	Ms. Saadia Syed	DACUM Expert, PTEVTA Lahore
2	Mr. Muhammad Hashim	Training & Development officer, Agrilla Seeds Faisalabad
3	Dr. Sumaira Maqsood	Associate professor, Punjab University, Lahore



Soil, Water and Fertilizer Testing Lab Technician



4	Ms. Hina Ashraf	Phd Scholar , Punjab University Lahore
5	Mr. Muhammad Saeed Ahmed	Agriculture Officer, UVAS, Pattoki
6	Mr Abid Mahmood	Scientific Officer, Agriculture Department, KPK Peshawar
7	Mr. Tariq Ullah	Lecturer GCT D.I.Khan, KPK TEVTA
8	Mr Farhan Mahmood	Assistant Director, Parks & Horticulture Authority (PHA), Rawalpindi
9	Dr. Naeem Abbas	Senior Scientific officer, CEPS lab Lahore
10	Ms. Iqra Haider Khan	Phd Scholar, Punjab University, Lahore
11	Dr Asma Saeed	Chief Scientific Officer, PCSIR Lahore
12	Engr. Liaqat Ali jamhroo	Director, Academics, STEVTA
13	Mr. Zia ur Rehman	Dy. Director, KPK TEVTA
14	Mr. Abdur Rehman	PBTE Representative, Lahore
15	Ms. Saima Akhtar	NRSP, UPAP, Faisalabad



Soil, Water and Fertilizer Testing Lab Technician

