



Soil, Water and Fertilizer Testing Jr. Lab Assistant



National Vocational Qualification level – 4 **“Soil, Water and Fertilizer Testing Lab Assistant”**



(Curriculum)



Soil, Water and Fertilizer Testing Jr. Lab Assistant



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

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1. 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 Assistant 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).



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2. 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.

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 Assistant. 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 Agricultural 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.



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

3. Overall objectives of training program:

The main objectives of the **Soil, Water and Fertilizer Testing Lab Assistant** (Level-4) are as follows:

1. Handling of sophisticated level Equipment I
2. Perform Calcium & Magnesium test of water by Titrimetric Method
3. Perform Carbonates & Bicarbonates test by Titrimetric Method
4. Perform Chloride (Cl) test by Titrimetric Method
5. Perform Sodium (Na) test for water by Flame-Photometric Method
6. Perform Potassium (K) test by Flame-Photometric Method
7. Handling of sophisticated level Equipment II



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8. Perform Boron (Water-Soluble) in Fertilizers through Spectrophotometer
9. Perform Soil Boron Test
10. Perform Soil Extractable Phosphorus Test
11. Perform Soil Extractable Potassium Test
12. Perform Total phosphorus In Solid, Liquid And Mixed Fertilizer By Titrimetric Method
13. Develop Workplace Policy and Procedures for Sustainability
14. Maintain Professionalism in the Workplace
15. Manage Personal Work Priorities and Professional Development
16. Manage Workforce Planning
17. Undertake Project Work
18. Prepare and Implement Negotiation
19. Manage Meetings
20. Organize Schedules
21. Identify and Communicate Trends in Career Development
22. Apply Specialist Interpersonal and Counseling Interview Skills.

4. Competencies to be gained after completion of course:

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

National Qualification in the Soil, Water and Fertilizer Testing Lab Assistant (Level-4).



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1. Handling of sophisticated level Equipment 1
2. Perform Calcium & Magnesium test of water by Titrimetric Method
3. Perform Carbonates & Bicarbonates test by Titrimetric Method
4. Perform Chloride (Cl) test by Titrimetric Method
5. Perform Sodium (Na) test for water by Flame-Photometric Method
6. Perform Potassium (K) test by Flame-Photometric Method
7. Handling of sophisticated level Equipment 1
8. Perform Boron (Water-Soluble) in Fertilizers through Spectrophotometer
9. Perform Soil Boron Test
10. Perform Soil Extractable Phosphorus Test
11. Perform Soil Extractable Potassium Test
12. Perform Total phosphorus In Solid, Liquid And Mixed Fertilizer By Titrimetric Method

5. Entry level of trainees:

The entry for National Vocational Certificate level 4, in “**Soil, Water and Fertilizer Testing Lab Assistant**” are given below:

Title	Entry requirements
National Vocational Certificate level 4, in Soil, Water and Fertilizer Testing Lab Assistant	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 3, in Soil, Water and Fertilizer Testing Jr. Lab Assistant



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6. 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 Assistant**

7. Recommended trainer: trainee ratio

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

8. Medium of instruction i.e., language of instruction:

Instructions will be in Urdu/ English/ Local language.

9. Duration of the course (Total time, Theory & Practical time):

The distribution of contact hours is given below:

Total	-	1200 hours
Theory	-	240 hours (20%)
Practical	-	960 hours (80%)



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10. Description and structure of the course

Following is the structure of the course:

Level-4							
Performance of water related test	Sr. Lab Assistant for Water						
Handling of sophisticated level Equipment I		Level 4	Technical	24	96	120	12
Perform Calcium & Magnesium test of water by Titrimetric Method		Level 4	Technical	18	72	90	9
Perform Carbonates & Bicarbonates test by Titrimetric Method		Level 4	Technical	10	30	40	4
Perform Chloride (Cl) test by Titrimetric Method		Level 4	Technical	12	48	60	6
Perform Sodium (Na) test for water by Flame-Photometric Method		Level 4	Technical	17	63	80	8
Perform Potassium (K) test by Flame-Photometric Method		Level 4	Technical	17	63	80	8
Occupation Total Hours				98	372	470	47
Performance of Soil and Fertilizer related test	Sr. Lab Assistant for soil						
Handling of sophisticated level Equipment II		Level 4	Technical	24	96	120	12
Perform Boron (Water-Soluble) in Fertilizers through Spectrophotometer		Level 4	Technical	18	72	90	9
Perform Soil Boron Test		Level 4	Technical	12	48	60	6
Perform Soil Extractable Phosphorus Test		Level 4	Technical	12	48	60	6
Perform Soil Extractable Potassium Test		Level 4	Technical	12	48	60	6
Perform Total phosphorus in Solid, Liquid and Mixed Fertilizer by Titrimetric	Level 4	Technical	10	60	70	7	



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method								
Occupation Total Hours				88	372	460	46	
Manage Soft Skills		Soft Skills						
Develop Workplace Policy and Procedures for Sustainability			Level 4	Generic	6	24	30	3
Maintain Professionalism in the Workplace			Level 4	Generic	6	24	30	3
Manage Personal Work Priorities and Professional Development			Level 4	Generic	6	24	30	3
Manage Workforce Planning			Level 4	Generic	6	24	30	3
Undertake Project Work			Level 4	Generic	6	24	30	3
Prepare and Implement Negotiation			Level 4	Generic	6	24	30	3
Manage Schedule and Meetings			Level 4	Generic	6	24	30	3
Identify and Communicate Trends in Career Development			Level 4	Generic	6	24	30	3
Apply Specialist Interpersonal and Counseling Interview Skills			Level 4	Generic	6	24	30	3
Occupation Total Hours				54	216	270	27	
LEVEL-4 TOTAL HOURS				240	960	1200	120	



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Level 4 (Technical Competencies)

Module-1. Handling of sophisticated level Equipment-I

Objective: After the completion of this module, the Trainee will be able to operate standard procedure for maintenance of equipment's used in different laboratory techniques to evaluate soil, water and fertilizer samples.

Duration: 120 Hours

Theory: 24 Hours

Practice: 96 Hours

Credit Hours: 12

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Maintain sophisticated level equipment	Trainee will be able to: <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 	Knowledge based questions: <ul style="list-style-type: none"> • Describe the importance of equipment cleanliness • Define standard procedures for given equipment working 	Theory-06 Hrs. Practical- 24 Hrs. Total- 30 Hrs.	<ul style="list-style-type: none"> • Drawing sheet • First Aid Kit • Atomic Absorption spectrophotometer • Autoclave • Baucus Shaker • Block digestion • Centrifuge machine • Dispenser • Flame Photo meter 	Classroom/ Lab



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	<ul style="list-style-type: none"> • Avoid self-repairing and adjustments of equipment without informing in-charge • Ensure proper placing of equipment after use as per lab protocols • Maintain list of sophisticated level of equipment following prescribed format • Periodically verify and update maintenance list according to plan • Follow safety guidelines as per equipment manual 	<ul style="list-style-type: none"> • Explain the importance of equipment maintenance log • Knowledge of hazards associated with equipment self-repairing • Explain how to handle laboratory equipment's after use • Describe equipment's maintenance protocols and their checklist • Explain periodic activities to maintain equipment • Describe safety protocols for each equipment as per 		<ul style="list-style-type: none"> • Flow injection analyser • Kjeldahl Unit • Laminar flow • Oscillator shaker • Pressure plate apparatus • Reciprocating Shakers • Spectrophotometer • Water Distillation Unit 	
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		<p>given instructions</p> <p><u>Practical Activity:</u></p> <p>Make a layout for equipment maintenance protocols</p>			
<p>LU2.</p> <p>Operate sophisticated level equipment</p>	<p>Trainee will be able to:</p> <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 equipment's 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 procedure switch off all 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Define SOPs • Explain the importance of calibration and equipment check • State lab safety rules and guidelines required to operate given equipment 	<p>Theory-06 Hrs.</p> <p>Practical- 24 Hrs.</p> <p>Total- 30 Hrs.</p>	<ul style="list-style-type: none"> • Drawing sheet • First Aid Kit • Atomic Absorption spectrophotometer • Auto clave • Baucus Shaker • Block digestion • Centrifuge machine • Dispenser • Flame Photo meter • Flow injection analyser • Kjeldahl Unit • Laminar flow • Oscillator shaker • Pressure plate apparatus 	<p>Classroom/Lab</p>



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	<p>equipment as instructed</p> <ul style="list-style-type: none"> Follow safety guidelines while operating equipment 	<p><u>Practical Activity:</u></p> <p>Prepare a flow sheet to explain the working of given lab equipment</p>		<ul style="list-style-type: none"> Reciprocating Shakers Spectrophotometer Water Distillation Unit 	
<p>LU3.</p> <p>Perform troubleshooting</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Monitor all errors and record data as instructed Perform basic troubleshoot as prescribed Follow safety guideline during troubleshooting Report in-charge immediately as instructed Maintain troubleshoot history sheet as instructed 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Define equipment error Explain error types Describe troubleshooting and its types Explain basic steps of troubleshooting equipment breakdowns <p><u>Practical Activity:</u></p> <p>Prepare a report on general troubleshooting safety</p>	<p>Theory-06 Hrs.</p> <p>Practical- 24 Hrs.</p> <p>Total- 30 Hrs.</p>	<ul style="list-style-type: none"> Drawing sheet First Aid Kit Atomic Absorption spectrophotometer Auto clave Baucus Shaker Block digestion Centrifuge machine Dispenser Flame Photo meter Flow injection analyser Kjeldahl Unit Laminar flow Oscillator shaker Pressure plate apparatus Reciprocating 	Classroom/Lab



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		practices		<ul style="list-style-type: none"> • Shakers • Spectrophotometer • Water Distillation Unit 	
LU4. Calibrate equipment	lab Trainee will be able to: <ul style="list-style-type: none"> • Prepare document for calibrating equipment's 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 calibration • Describe basic principle and purpose of calibration • Explain the importance of calibration records <p>Practical Activity:</p> <p>Perform calibration of given lab equipment</p>	<p>Theory-06 Hrs.</p> <p>Practical- 24 Hrs.</p> <p>Total- 30 Hrs.</p>	<ul style="list-style-type: none"> • Drawing sheet • Atomic Absorption spectrophotometer • Auto clave • Baucus Shaker • Block digestion • Centrifuge machine • Dispenser • Flame Photo meter • Flow injection analyser • Kjeldahl Unit • Laminar flow • Oscillator shaker • Pressure plate apparatus • Reciprocating Shakers • Spectrophotometer • Water Distillation 	Classroom/Lab



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				Unit	
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Module-2. Perform Calcium & Magnesium test of water by Titrimetric Method

Objective: After the completion of this module, the Trainee will be able to prepare samples for laboratory testing, testing procedure for analyzing Calcium and Magnesium in Water, Quality checks, calculation of results and precautions adopted for performing test.

Duration: 90 Hours

Theory: 18 Hours

Practice: 72 Hours

Credit Hours: 9

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to: <ul style="list-style-type: none"> • Check sample label for required test. • Keep sample at required temperature. • Ensure availability of standard solutions according to test procedure. • Set equipment according to test requirement. • Wash all glassware as per lab procedure. • Standardize EDTA solution with 	Knowledge based questions: <ul style="list-style-type: none"> • Describe the importance of sample labelling • Explain sample storage conditions required for analysis • Define standard solution • Explain the use of EDTA 	Theory- 3 Hrs. Practical- 12 Hrs. Total- 15 Hrs.	<ul style="list-style-type: none"> • Drawing sheet • Burette • EDTA (0.01 M) • Deionized/ distilled water • Glass Beaker (Class A) • Volumetric Flask 100 ml • Auto-pipette 10 ml 	Classroom/ Lab



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	<p>specified work instructions.</p> <ul style="list-style-type: none"> Conduct pre-use and safety checks. 	<p>solution</p> <p><u>Practical Activity:</u></p> <p>Prepare 1M EDTA solution</p>			
<p>LU2.</p> <p>Perform calcium test</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Take sample in titration flask according to test procedure. Add NaOH normal solution according to test procedure. Add indicator according to test procedure. Titrate it against EDTA till end point according to prescribed procedure. Calculate end results according to defined procedure. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Define titration Explain the role of NaOH in titration method Describe the specific indicator used in titration Explain the procedure for calcium test Discuss precautionary measures to ensure accurate end results <p><u>Practical Activity:</u></p>	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> Burette EDTA (0.01 M) NaOH (1M) Murexide Indicator Deionized/ distilled water Glass Beaker (Class A) Volumetric Flask 100 ml Auto-pipette 10 ml Calcium Standard solution of 100 ppm Titration flask Reagent bottles 	<p>Classroom/ Lab</p>



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		Perform standardization of EDTA solution		<ul style="list-style-type: none"> Erichrome black T Indicator 	
LU3. Perform Mg test	Trainee will be able to: <ul style="list-style-type: none"> Take sample in titration flask according to test procedure. Add ammonia buffer according to test procedure. Add indicator according to test procedure. Titrate it against EDTA till end point according to prescribed procedure. Calculate end results according to defined procedure. 	Knowledge based questions: <ul style="list-style-type: none"> Define buffer solution Describe the role of ammonia buffer in EDTA titration Explain the working principle for magnesium test <p><u>Practical Activity:</u></p> <p>Prepare ammonia buffer for EDTA titration</p>	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> Burette EDTA (0.01 M) NaOH (1M) Murexide Indicator Deionized/ distilled water Glass Beaker (Class A) Volumetric Flask 100 ml Auto-pipette 10 ml Ammonia buffer Titration flask Reagent bottles Erichrome black T Indicator 	Classroom/ Lab



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<p>LU4.</p> <p>Perform Quality Control Checks</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Standardize EDTA as per lab quality assurance plan • 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. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe the function of blank sample in the determination of given test • Explain the purpose to maintain pH of a solution • Explain the importance of control sample for lab testing <p><u>Practical Activity:</u></p> <p>Prepare a Quality Control layout as per lab procedure</p>	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> • Burette • EDTA (0.01 M) • Deionized/ distilled water • Glass Beaker (Class A) • Volumetric Flask 100 ml • Auto-pipette 10 ml • Reagent bottles 	<p>Classroom/ Lab</p>
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<p>LU5.</p> <p>Record the results/ Finalize work</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Note down Results on analyst workbook. • Record the results on result record form and submit to reporting section • Clear and restore work area. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe formula to calculate given results • Explain results documentation • State the role of data record keeping in quality control <p><u>Practical Activity:</u> Prepare a data sheet for record keeping</p>	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> • Pencil • Eraser • Sharpner • Paper sheets • Workbook 	<p>Classroom/ Lab</p>
<p>LU6.</p> <p>Adopt precautions during work</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Maintain pH of sample at required value. • Store buffer solution according to procedural requirement. • Use acids as per MSDS. • Ensure safety protocols for 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe storage conditions for buffer solutions • Explain the need of safety measures for required 	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> • pH meter • Reagent bottles • Glass Beaker (Class A) 	<p>Classroom Lab</p>



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	required procedure.	chemicals <ul style="list-style-type: none">• Discuss precautionary measures to ensure accurate end results <u>Practical Activity:</u> Perform calibration of pH meter			
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Module-3: Perform Carbonates & Bicarbonates test by Titrimetric Method

Objective: After the completion of this module, the Trainee will be able to prepare samples for laboratory testing, testing procedure for Water Alkalinity, Quality checks, calculation of results and precautions adopted for performing test.

Duration: 40 Hours

Theory: 10 Hours

Practice: 30 Hours

Credit Hours: 4

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to: <ul style="list-style-type: none"> • Check sample label for required test. • Keep sample at required temperature. • Ensure availability of standard solutions according to test procedure. • Set equipment according to test requirement. 	Knowledge based questions: <ul style="list-style-type: none"> • Describe basic requirements for given test • Describe the use of H₂SO₄ in given test • Explain preparation and 	Theory- 2 Hrs. Practical- 3 Hrs. Total- 5 Hrs.	<ul style="list-style-type: none"> • Sulfuric Acid solution • Deionized/ distilled water • Glass Beaker (Class A) • Volumetric Flask 100 ml • Auto-pipette 50ml • Glass rod 	Classroom Lab



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	<ul style="list-style-type: none"> Wash all glassware as per lab procedure. Standardize H₂SO₄ normal solution with specified work instructions. Conduct pre-use and safety checks. 	<p>standardization of H₂SO₄ normal solution</p> <p><u>Practical Activity:</u></p> <p>Prepare and standardize 0.1 M H₂SO₄ solution</p>		<ul style="list-style-type: none"> Reagent bottles 	
<p>LU2.</p> <p>Perform Carbonate and Bicarbonate test</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Take required amount of sample in titration flask according to procedural requirement. Add phenolphthalein indicator and check for presence of carbonates as per procedure. Titrate sample against known concentration of H₂SO₄ solution as per procedure. Note down reading according to lab format for carbonate. Add Methyl orange indicator 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Define titrimetric analysis Describe the use of phenolphthalein and methyl orange in titration Explain working principle of carbonate and bicarbonate test <p><u>Practical Activity:</u></p> <p>Demonstrate experimental</p>	<p>Theory- 2 Hrs.</p> <p>Practical- 9 Hrs.</p> <p>Total- 11 Hrs.</p>	<ul style="list-style-type: none"> Burette Sulfuric Acid solution Phenolphthalein + Methyl orange (color indicators) Titration flask Glass rod Deionized/ distilled water Glass Beaker (Class A) Volumetric Flask 100 ml 	<p>Classroom</p> <p>Lab</p>



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	<p>and check for presence of bicarbonates as per procedure.</p> <ul style="list-style-type: none"> • Perform replicate test as per standard procedure. • Calculate final reading according to procedure. 	<p>setup for titration</p>		<ul style="list-style-type: none"> • Auto-pipette 50ml • Glass rod • Reagent bottles 	
<p>LU3.</p> <p>Perform Quality Control Checks</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Standardize H₂SO₄ solution as per lab quality assurance plan • 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. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Define standardization of H₂SO₄ solution • Describe essentials of quality control check <p>Practical Activity:</p> <p>Prepare Quality Control charts as per lab procedure.</p>	<p>Theory- 2 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Burette • Sulfuric Acid solution • Titration flask • Glass rod • Deionized/ distilled water • Glass Beaker (Class A) • Volumetric Flask 100 ml • Auto-pipette 50ml • Glass rod • Reagent bottles 	<p>Classroom Lab</p>



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<p>LU4. Record the results</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Calculate and Note down Results on analyst workbook. • Record results on result record form and submit to reporting section • Clear and restore work area. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe steps to maintain data and restore workplace <p><u>Practical Activity:</u> Demonstrate the results of carbonate and bicarbonate test on data sheet</p>	<p>Theory- 2 Hrs. Practical- 6 Hrs. Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Pencil • Eraser • Sharpner • Paper sheets • Workbook 	<p>Classroom Lab</p>
<p>LU5. Adopt precautions during work</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Handle Sulphuric acid according to lab safety protocols. • Ensure use of desiccated Sodium Carbonate for standardization as per SOP. • Avoid loss of dissolved gasses during titration. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe safety measures while handling acids in lab <p><u>Practical Activity:</u> Prepare acid solution considering safety precautions in lab</p>	<p>Theory- 2 Hrs. Practical- 6 Hrs. Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Sulfuric Acid solution • Sodium carbonate solution (0.05N) • Deionized/ distilled water 	<p>Classroom Lab</p>



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Module-4: Perform Chloride (Cl) test by Titrimetric Method

Objective: After the completion of this module, the Trainee will be able to prepare samples for laboratory testing, testing procedure for testing chloride in Water, Quality checks, calculation of results and precautions adopted for performing test.

Duration: 60 Hours

Theory: 12 Hours

Practice: 48 Hours

Credit Hours: 6

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to: <ul style="list-style-type: none"> Check sample label for required test. Keep sample at required temperature. Ensure availability of standard solutions according to test procedure. Set equipment according to test requirement. Standardize silver nitrate with sodium chloride solution according to test method. 	Knowledge based questions: <ul style="list-style-type: none"> Describe steps involved in sample preparation for given test Explain the standardization of silver nitrate solution <p><u>Practical Activity:</u> Perform standardization of silver</p>	<p>Theory- 2 Hrs.</p> <p>Practical- 9 Hrs.</p> <p>Total- 11 Hrs.</p>	<ul style="list-style-type: none"> Standard Silver Nitrate: (0.05 N) Sodium chloride standard solution Deionized/ distilled water Glass Beaker (Class A) Volumetric Flask 100 ml Auto-pipette 	Classroom Lab



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	<ul style="list-style-type: none"> Wash all glassware as per lab procedure. 	nitrate solution		10ml <ul style="list-style-type: none"> Reagent bottles Titration flasks Glass rod Reagent bottles 	
LU2. Perform Procedure samples	test on Trainee will be able to: <ul style="list-style-type: none"> Take required amount of sample in titration flask according to procedural requirement. Add potassium dichromate indicator as per test method. Titrate sample against known concentration of AgNO_3 solution as per procedure. Note down reading according to lab format. Perform replicate test as per standard procedure. Calculate results according to procedure. 	Knowledge based questions: <ul style="list-style-type: none"> Describe the working principle of titrimetric method Explain the use of potassium dichromate in titration <u>Practical Activity:</u> Prepare a given concentration of silver nitrate solution	Theory- 3 Hrs. Practical- 12 Hrs. Total- 15 Hrs.	<ul style="list-style-type: none"> Burette Standard Silver Nitrate: (0.05 N) Potassium chromate Indicator solution Deionized/ distilled water Glass Beaker (Class A) Volumetric Flask 100 ml Auto-pipette 10ml Reagent bottles Titration flasks 	Classroom Lab



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				<ul style="list-style-type: none"> • Glass rod 	
<p>LU3.</p> <p>Perform Quality Control Checks</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Standardize AgNO_3 standard solution as per lab quality assurance plan • 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. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Define standardization • Explain the role of standardization • Describe the main objectives of quality control check <p><u>Practical Activity:</u> Prepare Quality Control chart as per lab procedure</p>	<p>Theory- 2 Hrs.</p> <p>Practical- 9 Hrs.</p> <p>Total- 11 Hrs.</p>	<ul style="list-style-type: none"> • Burette • Standard Silver Nitrate: (0.05 N) • Sodium chloride standard solution • Deionized/ distilled water • Glass Beaker (Class A) • Volumetric Flask 100 ml • Auto-pipette 10ml • Reagent bottles • Titration flasks • Glass rod 	<p>Classroom Lab</p>



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<p>LU4.</p> <p>Record the results</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Note down the Results on analyst workbook. • Record the results on result record form and submit to reporting section • Clear and restore work area. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Explain method of data calculation and result analysis <p><u>Practical Activity:</u> Perform calculation for estimation of Chloride (Cl) amount in given test sample</p>	<p>Theory- 3 Hrs. Practical- 9 Hrs. Total- 12 Hrs.</p>	<ul style="list-style-type: none"> • Pencil • Eraser • Sharpner • Paper sheets • Workbook 	<p>Classroom Lab</p>
<p>LU5.</p> <p>Adopt precautions during work</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Store Silver nitrate stock solution as per standard requirement. • Use washed and cleaned glassware for analysis • Weigh silver nitrate as per standard requirement. • Ensure PPE required for analysis. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe specific storage conditions for silver nitrate solution • Explain the importance of cleaning glassware <p><u>Practical Activity:</u> Demonstrate the precautionary</p>	<p>Theory- 2 Hrs. Practical- 9 Hrs. Total- 11 Hrs.</p>	<ul style="list-style-type: none"> • Standard Silver Nitrate: (0.05 N) • Deionized/ distilled water • Glass Beaker (Class A) • Volumetric Flask 100 ml • Auto-pipette 10 ml • Reagent bottles 	<p>Classroom Lab</p>



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		steps for Chloride (Cl) test.		<ul style="list-style-type: none">• Glass rod	
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Soil, Water and Fertilizer Testing Jr. Lab Assistant



Module-5: Perform Sodium (NA) test for water by Flame-Photometric Method

Objective: After the completion of this module, the Trainee will be able to prepare samples for laboratory testing, testing procedure for testing sodium in Water, Quality checks, calculation of results and precautions adopted for performing test.

Duration: 80 Hours

Theory: 17 Hours

Practice: 63 Hours

Credit Hours: 8

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to: <ul style="list-style-type: none"> • Check sample label for requirement of analysis of Sodium. • keep sample at room temperature for few minutes. • Check for availability of Sodium standard solution of required concentration otherwise prepare as per standard procedure. • Arrange glassware and related equipment as per test requirements. 	Knowledge based questions: <ul style="list-style-type: none"> • Define testing requirements for Sodium analysis • Describe the importance of equipment cleanness • Explain the necessary conditions for Flame- 	Theory- 4 Hrs. Practical- 15 Hrs. Total- 19 Hrs.	<ul style="list-style-type: none"> • Auto Pipette 10 ml • Sodium Standard (20-100 ppm) • Deionized/ distilled water • Glass Beakers (Class A) • Volumetric Flasks 100 ml • Reagent bottles 	Classroom Lab



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		<p>Photometer</p> <ul style="list-style-type: none"> • Discuss the limitations of Flame-Photometer <p><u>Practical Activity:</u></p> <p>Demonstrate the operating procedure of Flam-photometer</p>		<ul style="list-style-type: none"> • Glass funnel 	
<p>LU2.</p> <p>Perform Procedure samples</p> <p style="text-align: right;">test on</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Turn on instrument in accordance with the specified work instructions. • Conduct pre-use and safety checks as per manual. • Calibrate instrument as per lab protocol Aspire standard solutions as per test method. • Aspire sample as per standard test method. • Perform test sample replicates 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Define deionized distilled water • Discuss main steps involved in Sodium test • Explain the importance of flame photometer • Discuss the method of data calculation and result 	<p>Theory- 5 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 17 Hrs.</p>	<ul style="list-style-type: none"> • Flame-photometer • Auto Pipette 10 ml • Sodium Standard (20-100 ppm) • Deionized/ distilled water • Glass Beakers (Class A) • Volumetric 	<p>Class Room Lab</p>



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	<p>as per requirement.</p> <ul style="list-style-type: none"> • Store unused reagents and dispose of wastes as required by relevant regulations and codes. • Clean and store equipment as per lab protocol. 	<p>analysis</p> <p><u>Practical Activity:</u></p> <p>Perform sodium test of given sample</p>		<ul style="list-style-type: none"> • Flasks 100 ml • Reagent bottles • Filter paper • Glass funnel 	
<p>LU3.</p> <p>Perform Quality Control Checks</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Perform flame photometer intermediate checks as per lab quality assurance plan • 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. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Define intermediate checks • Explain the role of blank sample • Describe the importance of quality control measures <p><u>Practical Activity:</u></p> <p>Draw calibration curve of sodium standards</p>	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> • Flame-photometer • Auto Pipette 10 ml • Sodium Standard (20-100 ppm) • Deionized/ distilled water • Glass Beakers (Class A) • Volumetric Flasks 100 ml • Reagent bottles • Filter paper 	<p>Classroom Lab</p>



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				<ul style="list-style-type: none"> Glass funnel 	
LU4. Record the results/ Finalize work	Trainee will be able to: <ul style="list-style-type: none"> Calculate and Note down the Results on analyst workbook. Record the results on result record form and submit to reporting section Clear and restore work area. 	Knowledge based questions: <ul style="list-style-type: none"> Explain the importance of accurate results obtained from testing Discuss the formula to calculate Sodium concentration <u>Practical Activity:</u> Prepare the results of given sample of Sodium	Theory- 3 Hrs. Practical- 12 Hrs. Total- 15 Hrs.	<ul style="list-style-type: none"> Pencil Eraser Sharpner Paper sheets Workbook 	Classroom Lab
LU5. Adopt precautions during work	Trainee will be able to: <ul style="list-style-type: none"> Do not leave the instrument running unattended while flame is alight. Ensure running of instrument 	Knowledge based questions: <ul style="list-style-type: none"> Describe safety measures while using flame 	Theory- 2 Hrs. Practical- 12 Hrs. Total- 14 Hrs.	<ul style="list-style-type: none"> Flame-photometer Auto Pipette 10 ml Deionized/ distilled water 	Classroom Lab



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	<p>in fume hood or under chimney unit</p> <ul style="list-style-type: none">• Use deionized water after aspirating high concentration salt solution prior to shut down as per manual• Avoid using glass container to store calibration standards.	<p>photometer</p> <ul style="list-style-type: none">• Discuss the purpose and working of fume hood• Describe the storage method of standard solution <p><u>Practical Activity:</u> Prepare a layout on the operating procedure of flame photometer</p>		<ul style="list-style-type: none">• Reagent bottles	
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Soil, Water and Fertilizer Testing Jr. Lab Assistant



Module-6: Perform Potassium (k) test by Flame-Photometric Method

Objective: After the completion of this module, the Trainee will be able 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 Hours

Theory: 17 Hours

Practical: 63 Hours

Credit Hours: 8

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to: <ul style="list-style-type: none"> • Check sample label for requirement of analysis of Sodium. • keep sample at room temperature for few minutes. • Check for availability of potassium Standard solution of required concentration otherwise prepare as per standard procedure. 	Knowledge based questions: Describe importance of equipment cleanness. Explain the handling of Flame-Photometer. <u>Practical Activity:</u>	Theory- 4 Hrs. Practical- 12 Hrs. Total- 16 Hrs.	<ul style="list-style-type: none"> • Auto Pipette 10 ml • Potassium Standard (5 &-10 ppm) • Deionized water • Glass Beakers (Class A) • Volumetric Flasks 100 ml 	Classroom Lab



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	<ul style="list-style-type: none"> • Arrange Glassware and related Equipment as per test requirements. 	Demonstrate standard procedure for potassium.		<ul style="list-style-type: none"> • Reagent bottles • Glass rod • Filter paper • Glass funnel 	
LU2. Perform test Procedure on samples	Trainee will be able to: <ul style="list-style-type: none"> • Turn on instrument in accordance with the specified work instructions. • Conduct pre-use and safety checks as per manual. • Calibrate instrument as per lab protocol Aspire standard solutions as per test method. • Aspire sample as per standard test method. • Perform test sample replicates as per requirement. • Store unused reagents and dispose of wastes as required by relevant regulations and codes. • Clean and store equipment as 	Knowledge based questions: <ul style="list-style-type: none"> • Explain the working principle of Flame-Photometer. • Describe the advantages and disadvantages of flame photometry. • Explain the standard test method of potassium ion determination. • Describe the fuel used in flame photometer. <p><u>Practical Activity:</u></p> <p>Prepare potassium standard for given</p>	<p>Theory- 5 Hrs.</p> <p>Practical- 15 Hrs.</p> <p>Total- 20 Hrs.</p>	<ul style="list-style-type: none"> • Analytical Balance • Flame-photometer • Auto Pipette 10 ml • Potassium Standard (5 &-10 ppm) • Deionized water • Glass Beakers (Class A) • Volumetric Flasks 100 ml • Reagent bottles • Glass rod • Filter paper 	Classroom Lab



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	per lab protocol.	concentration.		<ul style="list-style-type: none"> Glass funnel 	
LU3. Perform Quality Control Checks	Trainee will be able to: <ul style="list-style-type: none"> Perform flame photometer intermediate checks as per lab quality assurance plan 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. 	Knowledge based questions: Explain the flame photometer intermediate checks. Explain laboratory control samples. <u>Practical Activity:</u> Prepare Quality Control charts as per lab procedure.	Theory- 3 Hrs. Practical- 12 Hrs. Total- 15 Hrs.	<ul style="list-style-type: none"> Analytical Balance Flame-photometer Auto Pipette 10 ml Potassium Standard (5 &-10 ppm) Deionized water Glass Beakers (Class A) Volumetric Flasks 100 ml Reagent bottles Glass rod Filter paper Glass funnel 	Classroom Lab



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<p>LU4.</p> <p>Record the results/ Finalize work</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Calculate and Note down the Results on analyst workbook. • Record the results on result record form and submit to reporting section • Clear and restore work area. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe the formula for calculation of potassium concentration • Discuss the tool for cleanliness of work area. <p><u>Practical Activity:</u></p> <p>Tabulate the results of given sample of potassium.</p>	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> • Markers • Note book 	<p>Classroom</p> <p>Lab</p>
<p>LU5.</p> <p>Adopt precautions during work</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Adopt precautions for flame photometer usage. • Ensure running of instrument in fume hood or under chimney unit • Use deionized water after aspirating high concentration salt solution prior to shut down as per manual 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe precautionary measures while using flame-photometer. • Explain the storage conditions for potassium sample. <p><u>Practical Activity:</u></p>	<p>Theory- 2 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 14 Hrs.</p>	<ul style="list-style-type: none"> • Fume hood • Deionized water • Storage bottles • Analytical Balance • Flame-photometer • Auto Pipette 10 ml • Potassium Standard (5 &-10 	<p>Classroom</p> <p>Lab</p>



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	<ul style="list-style-type: none">• Ensure quality parameters of storage for calibration standards.	Demonstrate the precautionary steps for potassium determination.		ppm) <ul style="list-style-type: none">• Deionized water• Glass Beakers (Class A)• Volumetric Flasks 100 ml• Reagent bottles• Glass rod• Filter paper• Glass funnel	
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Module-7: Handling of sophisticated level Equipment II

Objective: After the completion of this module, the Trainee will be able to operate standard procedure for maintenance of equipment's used in different laboratory techniques to evaluate soil, water and fertilizer samples.

Duration: 120 Hours

Theory: 24 Hours

Practice: 96 Hours

Credit Hours: 12

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Maintain sophisticated level equipment	Trainee will be able to: <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 without informing in-charge 	Knowledge based questions: <ul style="list-style-type: none"> • Describe the importance of equipment cleanliness • Define standard procedures for given equipment working • Explain the importance of 	Theory-03 Hrs. Practical- 12 Hrs. Total- 15 Hrs.	<ul style="list-style-type: none"> • Drawing sheet • First Aid Kit • Atomic Absorption spectrophotometer • Autoclave • Baucus Shaker • Block digestion • Centrifuge machine • Dispenser • Flame Photo meter • Flow injection analyser • Kjeldahl Unit 	Classroom/Lab



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	<ul style="list-style-type: none"> • Ensure proper placing of equipment after use as per lab protocols • Maintain list of sophisticated level of equipment following prescribed format • Periodically verify and update maintenance list according to plan • Follow safety guidelines as per equipment manual 	<p>equipment maintenance log</p> <ul style="list-style-type: none"> • Knowledge of hazards associated with equipment self-repairing • Explain how to handle laboratory equipment's after use • Describe equipment's maintenance protocols and their checklist • Explain periodic activities to maintain equipment • Describe safety protocols for each equipment as per given instructions 		<ul style="list-style-type: none"> • Laminar flow • Oscillator shaker • Pressure plate apparatus • Reciprocating Shakers • Spectrophotometer • Water Distillation Unit 	
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		<p><u>Practical Activity:</u></p> <p>Make a layout for equipment maintenance protocols</p>			
<p>LU2.</p> <p>Operate sophisticated level equipment's</p>	<p>Trainee will be able to:</p> <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 equipment's 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 procedure switch off all equipment as instructed • Follow safety guidelines while 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Define SOPs • Explain the importance of calibration and equipment check • State lab safety rules and guidelines required to operate given equipment <p><u>Practical Activity:</u></p>	<p>Theory-09 Hrs.</p> <p>Practical- 36 Hrs.</p> <p>Total- 45 Hrs.</p>	<ul style="list-style-type: none"> • Drawing sheet • First Aid Kit • Atomic Absorption spectrophotometer • Autoclave • Baucus Shaker • Block digestion • Centrifuge machine • Dispenser • Flame Photo meter • Flow injection analyser • Kjeldahl Unit • Laminar flow • Oscillator shaker • Pressure plate apparatus • Reciprocating Shakers • Spectrophotometer 	<p>Classroom/Lab</p>



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	operating equipment	Prepare a flow sheet to explain the working of given lab equipment		<ul style="list-style-type: none"> Water Distillation Unit 	
LU3. Perform troubleshooting	Trainee will be able to: <ul style="list-style-type: none"> Monitor all errors and record data as instructed Perform basic troubleshoot as prescribed Follow safety guideline during troubleshooting Report in-charge immediately as instructed Maintain troubleshoot history sheet as instructed 	Knowledge based questions: <ul style="list-style-type: none"> Define equipment error Explain error types Describe troubleshooting and its types Explain basic steps of troubleshooting equipment breakdowns <u>Practical Activity:</u> Prepare a report on general troubleshooting safety practices	Theory-06 Hrs. Practical- 24 Hrs. Total- 30 Hrs.	<ul style="list-style-type: none"> Drawing sheet First Aid Kit Atomic Absorption spectrophotometer Auto clave Baucus Shaker Block digestion Centrifuge machine Dispenser Flame Photo meter Flow injection analyser Kjeldahl Unit Laminar flow Oscillator shaker Pressure plate apparatus Reciprocating Shakers Spectrophotometer 	Classroom/Lab



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				<ul style="list-style-type: none"> Water Distillation Unit 	
LU4. Calibrate equipment	lab Trainee will be able to: <ul style="list-style-type: none"> Prepare document for calibrating equipment's 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 calibration Describe basic principle and purpose of calibration Explain the importance of calibration records Practical Activity: Perform calibration of given lab equipment	Theory-06 Hrs. Practical- 24 Hrs. Total- 30 Hrs.	<ul style="list-style-type: none"> Drawing sheet Atomic Absorption spectrophotometer Auto clave Baucus Shaker Block digestion Centrifuge machine Dispenser Flame Photo meter Flow injection analyser Kjeldahl Unit Laminar flow Oscillator shaker Pressure plate apparatus Reciprocating Shakers Spectrophotometer Water Distillation 	Classroom/ Lab



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Module-8: Perform Boron (Water-Soluble) in Fertilizers through Spectrophotometric Method

Objective: After the completion of this module , the trainee will be able prepare sample and perform Boron (Water-Soluble) in Fertilizers through Spectrophotometric Method and record results according to standard lab procedure.

Duration: 90 Hours

Theory: 18 Hours

Practical: 72 Hours

Credit Hours: 9

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to: <ul style="list-style-type: none"> • Check sample label for required test. • Maintain Laboratory room temperature as per requirement. • Check for availability of standard solution as per requirement. • Set up equipment in 	Knowledge based questions: <ul style="list-style-type: none"> • Define micronutrient • Describe importance of Boron in soil • Explain compound fertilizers Practical Activity: Arrange required apparatus as	Theory- 3 Hrs. Practical- 12 Hrs. Total- 15 Hrs.	<ul style="list-style-type: none"> • Weighing balance • Spectrophotometer • Volumetric flask 50, 100, 500, and 1000 ml • Polypropylene tube with cap 15 ml • Graduated pipette • Automatic pipette 0.1ml, 5ml • Glass beaker (Pyrex) • Funnel 	Classroom Lab



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	<p>accordance with the standard work instructions.</p> <ul style="list-style-type: none"> • Conduct pre-use and safety checks. 	per SOP to conduct Boron test		<ul style="list-style-type: none"> • Wash bottle • Boron standard solution: • Azomethine H color reagent: • Ammonium Acetate, Potassium Acetate, Nitrilotriacetic acid, disodium salt • Tetraacetic Acid. 	
<p>LU2.</p> <p>Perform Procedure test on samples</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Prepare sample according to requirement • Weight sample of according to requirement. • Process sample as per standard testing method. • Take reading and prepare standard curve as required • Perform calculations 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe the use of Spectrophotometer • Describe coloring reagent used in this test • Explain the Working principle of subjected test <p>Practical Activity:</p> <ul style="list-style-type: none"> • Prepare standard curve of 	<p>Theory- 5 Hrs.</p> <p>Practical- 18 Hrs.</p> <p>Total- 23 Hrs.</p>	<ul style="list-style-type: none"> • Weighing balance • Spectrophotometer • Volumetric flask 50, 100, 500, and 1000 ml • Polypropylene tube with cap 15 ml • Graduated pipette • Automatic pipette 0.1ml, 5ml • Glass beaker (Pyrex) • Funnel • Wash bottle • Boron standard solution: • Azomethine H color 	<p>Classroom</p> <p>Lab</p>



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	<p>as per standard procedure.</p> <ul style="list-style-type: none"> • Store unused reagents and dispose of wastes as required by relevant regulations and codes. • Clean and store equipment as per lab protocol 	<p>obtained results according to SOP</p>		<p>reagent:</p> <ul style="list-style-type: none"> • Ammonium Acetate, • Potassium Acetate, Nitritotriacetic acid, • disodium salt • Tetracetic Acid. 	
<p>LU3.</p> <p>Perform Quality Control Checks</p>	<p>Trainee will be able to:</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 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Define working standards • Describe the importance of control samples in testing <p><u>Practical Activity:</u></p> <p>Draw calibration curve with boron standard solution</p>	<p>Theory- 4 Hrs.</p> <p>Practical- 15 Hrs.</p> <p>Total- 19 Hrs.</p>	<ul style="list-style-type: none"> • Weighing balance • Spectrophotometer • Volumetric flask 50, 100, 500, and 1000 ml • Polypropylene tube with cap 15 ml • Graduated pipette • Automatic pipette 0.1ml, 5ml • Glass beaker (Pyrex) • Funnel • Wash bottle • Boron standard solution • Azomethine H color 	<p>Classroom Lab</p>



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	<p>procedure</p> <ul style="list-style-type: none"> Always used valid standards 			<p>reagent</p> <ul style="list-style-type: none"> Ammonium Acetate, Potassium Acetate, Nitritotriacetic acid, disodium salt Tetraacetic Acid. 	
<p>LU4.</p> <p>Record the results</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Note down Results on analyst workbook. Perform detail calculations Submit results to lab In-charge Clear and restore work area. 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Discuss the chemical used in subjected test <p><u>Practical Activity:</u></p> <p>Perform calculation and record results on data sheet</p>	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> PPEs Note books Pencil Lab registers Prescribed format 	<p>Classroom</p> <p>Lab</p>
<p>LU5.</p> <p>Adopt precautions during work</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Ensure before taking any measurement that instrument has been calibrated. Perform dilutions if required 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Define SOP Differentiate calibrated and non-calibrated equipment <p><u>Practical Activity:</u></p>	<p>Theory- 3 Hrs.</p> <p>Practical- 15 Hrs.</p> <p>Total- 18 Hrs.</p>	<ul style="list-style-type: none"> Weighing balance Spectrophotometer Volumetric flask 50, 100, 500, and 1000 ml Polypropylene tube with cap 15 ml Graduated pipette 	<p>Classroom</p> <p>Lab</p>



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	<ul style="list-style-type: none">• Always use clean and transparent cuvettes	Demonstrate dilution		<ul style="list-style-type: none">• Automatic pipette 0.1 ml, 5 ml• Glass beaker (Pyrex)• Funnel• Wash bottle• Boron standard solution:• Azomethine H color reagent:• Ammonium Acetate,• Potassium Acetate,• Nitrilotriacetic acid,• disodium salt• Tetracetic Acid	
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Module-9: Perform Soil Boron Test

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

Duration: 60 Hours

Theory: 12 Hours

Practical: 48 Hours

Credit Hours: 6

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to: <ul style="list-style-type: none"> • Check sample label for required test. • Maintain Laboratory room temperature as per requirement. • Arrange equipment and safety requirements as per standard method. • Set up apparatus in accordance with the standard work 	Knowledge based question: <ul style="list-style-type: none"> • Explain the purpose of using deionized water in subjected test • Explain sample management procedure • Describe safety guidelines for 	Theory- 2 Hrs. Practical- 9 Hrs. Total- 11 Hrs.	<ul style="list-style-type: none"> • Analytical balance • Extraction/rea gent bottles • Volumetric flasks • Pipette • Boron standard • Deionized water 	Classroom Lab



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	<p>instructions.</p> <ul style="list-style-type: none"> • Conduct pre-use and safety checks. 	<p>maintenance of working equipment</p> <p><u>Practical Activity:</u></p> <p>Enlist standard work instructions for required test</p>			
<p>LU2. Perform test Procedure on samples</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Take required amount of soil in extraction/reagent bottle as per recommended procedure. • Add HCl and shake as per standard method. • Transfer filtered sample to volumetric flask according to procedural requirement. • Add buffer solution and Azomethine-H color reagent as per standard method. • Prepare Boron standards as per requirement. • Observe reading on 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Describe standard operating procedures for boron test • Describe the effect of buffer solution in soil boron test. • Explain the role of Azomethine-H in soil boron testing. <p><u>Practical Activity:</u></p> <p>Prepare standard boron solution</p>	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> • Analytical balance • Extraction/reagent bottles • Volumetric flasks • Pipette • Boron standard • Deionized water 	<p>Classroom</p> <p>Lab</p>



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	<p>spectrophotometer and draw standard curve as per standard procedure.</p>				
<p>LU3. Perform Quality Control Checks</p>	<p>Trainee will be able to:</p> <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. 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Define the role of blank sample in quality control check. • State the importance of sample replicates <p><u>Practical Activity:</u> Run blank sample according to procedure.</p>	<p>Theory- 3 Hrs. Practical- 12 Hrs. Total- 15 Hrs.</p>	<ul style="list-style-type: none"> • Pencil • Eraser • Sharpener • Calculator • Notepads 	<p>Classroom Lab</p>
<p>LU4. Record the results</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Calculate soil boron through standard curve. • Submit the results to lab In-charge • Clear and restore work area. 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Describe method to calculate soil Boron <p><u>Practical Activity:</u></p>	<p>Theory- 2 Hrs. Practical- 9 Hrs. Total- 11 Hrs.</p>	<ul style="list-style-type: none"> • Pencil • Eraser • Sharpener • Calculator • Notepads 	<p>Classroom Lab</p>



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		Draw standard curve for boron estimation in soil			
LU5. Adopt precautions during work	Trainee will be able to: <ul style="list-style-type: none"> • Ensure calibration of equipment as per standard requirement. • Use clean and good quality cuvette • Ensure use of fresh color developing reagent for boron. • Use boron free glassware as per standard requirement. 	Knowledge based question: <ul style="list-style-type: none"> • Explain the objective of calibration • Describe precautionary measures while performing given test. • Discuss important factor affecting the determination of boron from soil. <u>Practical Activity:</u> Prepare a flow sheet for safety measures while performing given test	Theory- 2 Hrs. Practical- 6 Hrs. Total- 8 Hrs.	<ul style="list-style-type: none"> • Cuvette • Glassware • Boron standard 	Classroom Lab



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Module-10: Perform Soil Extractable Phosphorus Test

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

Duration: 60 Hours

Theory: 12 Hours

Practical: 48 Hours

Credit Hours: 6

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to: <ul style="list-style-type: none"> • Check the sample label for the required test. • Ensure Laboratory room temperature as per requirement. • Arrange equipment and safety requirements as per standard method. • Set up apparatus in accordance with the standard work 	Knowledge based question: <ul style="list-style-type: none"> • Explain method for sample preparation • Explain the reason to conduct pre-use safety checks. • Describe safety guidelines for 	Theory- 2 Hrs. Practical- 09 Hrs. Total- 11 Hrs.	<ul style="list-style-type: none"> • Analytical Balance • Spectrophotometer • Extraction/Reagent Bottles • Volumetric flasks • Pipette • Filter Paper • Ascorbic acid • Ammonium heptamolydate • Potassium antimony tartrate • Sulfuric acid 	Classroom Lab



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	<p>instructions.</p> <ul style="list-style-type: none"> • Conduct pre-use and safety checks. 	<p>maintenance of work equipment</p> <p><u>Practical Activity:</u></p> <p>Prepare a layout for standard work instructions</p>		<ul style="list-style-type: none"> • Phosphorus standard • Distilled water 	
<p>LU2. Perform test Procedure on samples</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Take required amount of soil in extraction/reagent bottle as per recommended procedure. • Add recommended amount of extracting solution as per standard method. • Transfer filtered sample to volumetric flask as per standard method. • Add recommended amount of color developing reagent, mix and leave as per standard method. • Prepare phosphorus standards 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Define digestion process of soil sample for phosphorus determination • Explain standard method for soil extractable phosphorus determination test • Explain the principal of spectrophotometer • Describe the importance of spectrophotometry • Explain main components of 	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> • Analytical Balance • Spectrophotometer • Extraction/Reagent Bottles • Volumetric flasks • Pipette • Filter Paper • Ascorbic acid • Ammonium heptamolydate • Potassium antimony tartrate • Sulfuric acid • Phosphorus standard • Distilled water 	<p>Classroom</p> <p>Lab</p>



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	<p>as per requirement.</p> <ul style="list-style-type: none"> Observe reading on spectrophotometer as per standard method. 	<p>spectrophotometer</p> <p>Practical Activity:</p> <p>Demonstrate working of spectrophotometer</p>			
<p>LU3.</p> <p>Perform Quality Control Checks</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Ensure run time of instrument as per manual. Run blank sample accordingly. Perform replicate/re-testing as per lab standards. Record quality control data as per lab procedure. 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> Define blank sample Explain importance of blank sample Explain the significance for sample replication <p>Practical Activity:</p> <p>Prepare a data sheet for data recording</p>	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> Pencil Eraser Sharpener Calculator Notepads 	<p>Classroom</p> <p>Lab</p>



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<p>LU4. Record the results</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Calculate soil phosphorus through spectrophotometer reading using recommended formula. • Submit the results to lab In-charge • Clear and restore work area. 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Describe standard method to calculate soil phosphorus • Define soil phosphorus calculation formula <p><u>Practical Activity:</u> Calculate soil phosphorus from given data</p>	<p>Theory- 2 Hrs. Practical- 9 Hrs. Total- 11 Hrs.</p>	<ul style="list-style-type: none"> • Pencil • Eraser • Sharpener • Calculator • Notepads 	<p>Classroom Lab</p>
<p>LU5. Adopt precautions during work</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Ensure calibration of equipment if required. • Use clean and good quality cuvette as per standard method. • Use fresh color developing reagent for phosphorus as per standard requirement. • Ensure safety protocols as per standard method. 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Describe precautionary measures while performing given test • Explain the objective of calibration <p><u>Practical Activity:</u> Prepare a flow sheet for safety measures while performing given test</p>	<p>Theory- 2 Hrs. Practical- 6 Hrs. Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Analytical Balance • Spectrophotometer • Extraction/Reagent Bottles • Volumetric flasks • Pipette • Filter Paper • Ascorbic acid • Ammonium heptamolydate • Potassium antimony tartrate • Sulfuric acid • Phosphorus standard 	<p>Classroom Lab</p>



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				<ul style="list-style-type: none">• Distilled water	
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Module -11: Perform Soil Extractable Potassium Test

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

Duration: 60 Hours

Theory: 12 Hours

Practical: 48 Hours

Credit Hours: 6

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to: <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 apparatus in accordance with the standard work instructions. 	Knowledge based question: <ul style="list-style-type: none"> • Define extraction process • Describe the role of potassium in soil • Explain guidelines for preparing testing procedures <p style="text-align: center;"><u>Practical Activity:</u></p> <p>Enlist reagents and solvents used in</p>	Theory- 2 Hrs. Practical- 09 Hrs. Total- 11 Hrs.	<ul style="list-style-type: none"> • Analytical balance • Flame Photometer • Extraction/Reagent bottles • Conical flasks • Filter paper • Ascorbic acetate • Potassium chloride/ K standard • Distilled water 	Classroom Lab



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	<ul style="list-style-type: none"> Conduct pre-use and safety checks. 	given test			
LU2. Perform test on Procedure samples	Trainee will be able to: <ul style="list-style-type: none"> Take required amount of soil in conical flask as per recommended procedure. Add recommended amount of extracting solution/reagent bottle and shake as per standard procedure. Filter sample solution as per SOP. Prepare potassium standards as per requirement. Observe reading over Flame photometer as per manual. 	Knowledge based question: <ul style="list-style-type: none"> Define principle of flame photometer Describe the standard soil sample preparation Explain the protocol for potassium standard preparation. Practical Activity: Perform filtration of sample after extraction	Theory- 3 Hrs. Practical- 12 Hrs. Total- 15 Hrs.	<ul style="list-style-type: none"> Analytical balance Flame Photometer Extraction/Reagent bottles Conical flasks Filter paper Ascorbic acetate Potassium chloride/ K standard Distilled water 	Class Room Lab



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<p>LU3.</p> <p>Perform Quality Control Checks</p>	<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 potassium standards as per procedure. 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Define SOP for calibration of spectrophotometer with potassium standard • Describe essentials of quality control check <p><u>Practical Activity:</u></p> <p>Prepare potassium standard</p>	<p>Theory- 3 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> • Analytical balance • Flame Photometer • Extraction/Reagent bottles • Conical flasks • Filter paper • Ascorbic acetate • Potassium chloride/ K standard • Distilled water 	<p>Class Room</p> <p>Lab</p>
<p>LU4.</p> <p>Record the results</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Calculate soil potassium using Flame photometer by drawn calibration curve as per standard method. • Submit the results to lab In-charge • Clear and restore work area. 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Explain the method to calculate potassium in given soil sample • Knowledge about guidelines to maintain data and restore workplace. 	<p>Theory- 2 Hrs.</p> <p>Practical- 9 Hrs.</p> <p>Total- 11 Hrs.</p>	<ul style="list-style-type: none"> • Notebook • Pencil • Marker • Eraser • Sharpner 	<p>Class Room</p> <p>Lab</p>



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		<p><u>Practical Activity:</u> Draw calibration curve to calculate potassium concentration</p>			
<p>LU5. Adopt precautions during work</p>	<p>Trainee will be able to:</p> <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. 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Define calibration curve • Explain important safety precautions for the workplace • Describe the significance of using freshly prepared standards <p><u>Practical Activity:</u> Demonstrate the precautionary steps for potassium determination</p>	<p>Theory- 2 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Notebook • Pencil • Marker • Eraser • Sharpner 	<p>Class Room</p> <p>Lab</p>



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Module-12: Perform total phosphorus in solid, liquid, and mixed fertilizer by titrimetric method

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

Duration: 70 Hours

Theory: 10 Hours

Practical: 60 Hours

Credit Hours: 7

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Prerequisites for testing	Trainee will be able to: <ul style="list-style-type: none"> • Check sample label for the required test. • Maintain Laboratory room temperature as per requirement. • Check for availability of P standard as per requirement. • Set up equipment and reagents in accordance with standard work instructions. 	Knowledge based question: <ul style="list-style-type: none"> • Define titrimetry • Explain importance of sample management for required test • Explain the importance of pre use inspection <u>Practical Activity:</u> Arrange equipment for given test	Theory- 1 Hrs. Practical- 6 Hrs. Total- 7 Hrs.	<ul style="list-style-type: none"> • Weighing balance • Volumetric flask-100 ml, 500ml, 1000ml • Beaker-100 ml, 500ml, 100ml • Bulb type pipette 1ml, 2ml, 5ml,10ml • Conical flask-250ml, 500ml • Water bath • Wash Bottle • Filter paper Whatman No.42 • Funnel with stand • Blue Litmus paper • Filter paper sheet 	Class Room Lab



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	<ul style="list-style-type: none"> Conduct pre-use and safety checks. 			<ul style="list-style-type: none"> Thermometer Mechanical shaker Concentrated Nitric Acid Citric Acid Solution Ammonium Molybdate Solution/Ammonium Molybdate tetra hydrate. Ammonium Nitrate Solution/Ammonium Nitrate Phenolphthalein indicator, Sulphuric Acid. NaOH Potassium Hydrogen Phthalate Solution/Potassium Hydrogen Phthalate 	
LU2. Perform Procedure samples	test on Trainee will be able to: <ul style="list-style-type: none"> Weigh sample in volumetric flask according to requirement. Add concentrated nitric acid and citric acid solution as 	Knowledge based question: <ul style="list-style-type: none"> Explain the principle behind the use of litmus paper Describe the use of mechanical shaker Explain the working procedure of 	Theory- 4 Hrs. Practical- 24 Hrs. Total- 28 Hrs.	<ul style="list-style-type: none"> Weighing balance Volumetric flask-100 ml, 500ml, 1000ml Beaker-100 ml, 500ml, 100ml Bulb type pipette 1ml, 2ml, 5ml,10ml Conical flask-250ml, 500ml 	Class Room Lab



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	<p>per standard procedure.</p> <ul style="list-style-type: none"> • Process sample as per standard testing method. • Titrate against standardized sulphuric acid solution as per required SOP. • Perform test sample replicates as per requirement. • Perform calculations according to standard testing method. • Store unused reagents and dispose of wastes as required by relevant regulations and codes. • Clean and store equipment. 	<p>given test</p> <ul style="list-style-type: none"> • Describe specifications for use of concentrated nitric and citric acid <p><u>Practical Activity:</u></p> <p>Perform litmus test</p>		<ul style="list-style-type: none"> • Water bath • Wash Bottle • Filter paper Whatman No.42 • Funnel with stand • Blue Litmus paper • Filter paper sheet • Thermometer • Mechanical shaker • Concentrated Nitric Acid • Citric Acid Solution • Ammonium Molybdate Solution/Ammonium Molybdate tetra hydrate. • Ammonium Nitrate Solution/Ammonium Nitrate • Phenolphthalein indicator, • Sulphuric Acid. • NaOH • Potassium Hydrogen Phthalate Solution/Potassium Hydrogen Phthalate 	
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<p>LU3.</p> <p>Perform Quality Control Checks</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Ensure use of Standardized sulphuric acid as per SOP. • 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. 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Describe the importance of control sample for lab testing procedure • Explain the significance of data record keeping in quality control checks • Describe significance of performing replicate samples • Explain required SOP for preparation and standardization of sulfuric acid • Describe the data analysis method of given test <p><u>Practical Activity:</u></p> <p>Perform standardization of 0.1 M Sulphuric Acid as per SOP</p>	<p>Theory- 2 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 14 Hrs.</p>	<ul style="list-style-type: none"> • Weighing balance • Volumetric flask-100 ml, 500ml, 1000ml • Beaker-100 ml, 500ml, 100ml • Bulb type pipette 1ml, 2ml, 5ml,10ml • Conical flask-250ml, 500ml • Wash Bottle • Filter paper Whatman No.42 	<p>Class Room</p> <p>Lab</p>
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<p>LU4.</p> <p>Record the results</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Calculate and Note down the Results on analyst workbook. • Submit the results to lab In-charge • Clear and restore work area. 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Explain the formula of phosphorus estimation <p><u>Practical Activity:</u></p> <p>Prepare a data sheet for record keeping</p>	<p>Theory-1 Hrs.</p> <p>Practical- 06 Hrs.</p> <p>Total- 7 Hrs.</p>	<ul style="list-style-type: none"> • Pencils • Notebook • Eraser • Sharpener 	<p>Class Room</p> <p>Lab</p>
<p>LU5.</p> <p>Adopt precautions during work</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Ensure calibration of required equipment as per standard testing method. • Perform dilutions in case of liquid sample before running any batch sample • Critically observe the end point • Dispose-off waste as per SOP. • Handle acids as per MSDS. • Ensure safety protocols as 	<p>Knowledge based question:</p> <ul style="list-style-type: none"> • Describe steps to make dilution of given stock solution • Explain precautionary measures during work <p><u>Practical Activity:</u></p> <p>Demonstrate the safe disposal of reagents as per SOP</p>	<p>Theory- 2 Hrs.</p> <p>Practical- 12 Hrs.</p> <p>Total- 14 Hrs.</p>	<ul style="list-style-type: none"> • Pencils • Notebook • Eraser • Sharpener 	<p>Class Room</p> <p>Lab</p>



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	per standard requirement.				
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Level 4 (Generic Competencies)

Module-1: Develop workplace policy and procedures for sustainability.

Objective: After the completion of this competency standard, the Trainee will be able to develop and implement a workplace sustainability policy and to modify the policy to suit changed circumstances. It applies to individuals with managerial responsibilities who undertake work developing approaches to create, monitor and improve strategies and policies within workplaces and engage with a range of relevant stakeholders and specialists.

Duration: 30 Hours

Theory: 6 Hours

Practice: 24 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
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<p>LU1.</p> <p>Develop workplace sustainability policy</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Define scope of sustainability policy • Gather information from a range of sources to plan and develop policy • Identify and consult stakeholders as a key component of the policy development process • Include appropriate strategies in policy at all stages of work for minimizing resource use, reducing toxic material and hazardous chemical use and employing life cycle management approaches • Make recommendations for policy options based on likely effectiveness, timeframes and cost • Develop policy that reflects the organization s 	<ul style="list-style-type: none"> • Outline the environmental or sustainability legislation, regulations, and codes of practice applicable to the organization identify internal and external sources of information and • Explanation of plan and development of the organization sustainability policy 	<p>Theory- 2 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	<p>Class Room</p>
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	<p>commitment to sustainability as an integral part of business planning and as a business opportunity</p> <ul style="list-style-type: none"> • Agree to appropriate methods of implementation, outcomes and performance indicators 				
<p>LU2.</p> <p>Communicate workplace sustainability policy</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Promote workplace sustainability policy, including its expected outcome, to key stakeholders. • Inform those involved in implementing the policy about expected outcomes, activities to be undertaken and assigned responsibilities. 	<ul style="list-style-type: none"> • Outline organizational systems and procedures that relate to sustainability 	<p>Theory- 2 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	<p>Class Room</p>
<p>LU3.</p> <p>Implement workplace sustainability policy</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Develop and communicate procedures to help implement workplace sustainability policy 	<ul style="list-style-type: none"> • Outline typical barriers to implementing policies and procedures in an organization and possible 	<p>Theory- 1 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 7 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone 	<p>Class Room</p>



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	<ul style="list-style-type: none"> • Implement strategies for continuous improvement in resource efficiency • Establish and assign responsibility for recording systems to track continuous improvements in sustainability approaches 	strategies to address them.		<ul style="list-style-type: none"> • Printer • White board • Projector screen • Multimedia projector 	
<p>LU4.</p> <p>Review workplace sustainability policy implementation</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Review workplace sustainability policy implementation. • Investigate successes or otherwise of policy. • Monitor records to identify trends that may require remedial action and use to promote continuous improvement of performance. • Modify policy and or procedures as required to ensure improvements are made 	<ul style="list-style-type: none"> • Explain workplace policy development processes and practices 	<p>Theory- 1 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 7 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	Class Room



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Module-2: Maintain professionalism in the workplace

Objective: After the completion of this competency standard, the Trainee will be able to maintain a professional image in the workplace, including behaving ethically, demonstrating motivation, respecting timeframes and maintaining personal appearance.

Duration: 30 Hours

Theory: 6 Hours

Practice: 24 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Respect work timeframes	Trainee will be able to: <ul style="list-style-type: none"> • Demonstrate punctuality in meeting, set working hours and times. • Utilize working hours only for working and follow company regulations. • Complete work tasks within deadlines according to order of priority • Supervisors are informed of 	<ul style="list-style-type: none"> • Explain application of good manners and right conduct • Outline the company code of conduct/values 	Theory- 2 Hrs. Practical- 6 Hrs. Total- 8 Hrs.	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	Class Room



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	any potential delays in work times or projects				
LU2. Maintain personal appearance and hygiene	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Clean hair, body, and nails regularly. • Wear suitable cloths for the workplace, and respect local and cultural contexts • Meet specific company dress code requirements 	<ul style="list-style-type: none"> • Describe common products used for oral and personal hygiene 	<p>Theory- 2 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	Class Room
LU3. Maintain adequate distance with colleagues and clients	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Respect personal space of colleagues and clients with reference to local customs and cultural contexts. • Keep sufficient distance from 	<ul style="list-style-type: none"> • State workplace hygiene standards • Explain basic practices for oral and personal hygiene 	<p>Theory- 1 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 7 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board 	Class Room



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	<p>others</p> <ul style="list-style-type: none"> • Avoid cross transmission of infections (especially through respiration) 			<ul style="list-style-type: none"> • Projector screen • Mulmediaprojector 	
<p>LU4.</p> <p>Work in an ethical manner</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Follow company values/ethics codes of ethics and/or conduct, policies and guidelines. • Use company resources in accordance with company ethical standards. • Conduct personal behavior and relationships in accord with ethical standards and company policies. • Undertake work practices in compliance with company ethical standards, organizational policy and guidelines. • Instruct co-workers on ethical, 	<ul style="list-style-type: none"> • Outline the Company regulations, performance and ethical standards • Explain work responsibilities/job functions • Describe communication skills 	<p>Theory- 1 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 7 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	<p>Class Room</p>



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	<p>lawful, and reasonable directives.</p> <ul style="list-style-type: none">• Share company values /practices with co-workers using appropriate behavior and language.• Report work incidents /situations and/or resolved in accordance with company protocol /guidelines.				
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Module-3: Manage personal work priorities and professional development

Objective: After the completion of this competency standard, the Trainee will be able to create systems and process to organize information and prioritize tasks. It applies to individuals working in managerial positions who have excellent organizational skills. The work ethic of individuals in this role has a significant impact on the work culture and patterns of behavior of others as managers at this level are role models in their work environment.

Duration: 30 Hours

Theory: 6 Hours

Practice: 24 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Establish personal work goals	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Serve as a positive role model in the workplace through personal work planning • Ensure personal work goals, plans and activities reflect the organization 	<p>Explain principles and techniques involved in the management and organization of:</p> <ul style="list-style-type: none"> • <input type="checkbox"/> performance measurement • <input type="checkbox"/> personal behavior, self- 	<p>Theory- 2 Hrs. Practical- 8 Hrs. Total- 10 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board 	Class Room



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	<p>s plans, and own responsibilities and accountabilities</p> <ul style="list-style-type: none"> • Measure and maintain personal performance in varying work conditions, work contexts and when contingencies occur 	<p>awareness and personality traits identification</p> <ul style="list-style-type: none"> • □ a personal development plan • □ personal goal setting • □ time <p>Discuss management development opportunities and options for self</p> <p>Outline organization s policies, plans and procedures</p>		<ul style="list-style-type: none"> • Projector screen • Multimedia projector 	
<p>LU2. Set and meet own work priorities</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Take initiative to prioritize and facilitate competing demands to achieve personal, team and organizational goals and 	<p>Describe methods for achieving a healthy work-life balance</p>	<p>Theory- 2 Hrs. Practical- 8 Hrs. Total- 10 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer 	<p>Class Room</p>



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	<p>objectives</p> <ul style="list-style-type: none"> • Use technology efficiently and effectively to manage work priorities and commitments • Maintain appropriate work-life balance, and ensure stress is effectively managed and health is attended to 			<ul style="list-style-type: none"> • White board • Projector screen • Multimedia projector 	
<p>LU3. Develop and maintain professional competence</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Assess personal knowledge and skills against competency standards to determine development needs, priorities, and plans • Seek feedback from employees, clients and colleagues and use this feedback to identify and develop ways to improve competence • Identify, evaluate, select, and use development 	<p>Explain types of learning style/s and how they relate to the individual</p> <p>Describe types of work methods and practices that can improve personal performance.</p>	<p>Theory- 2 Hrs.</p> <p>Practical- 8 Hrs.</p> <p>Total- 10 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	<p>Class Room</p>



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	<p>opportunities suitable to personal learning style/s to develop competence</p> <ul style="list-style-type: none">• Participate in networks to enhance personal knowledge, skills and work relationships• Identify and develop new skills to achieve and maintain a competitive edge				
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Module-4: Manage workforce planning

Objective: After the completion of this competency standard, the Trainee will be able to manage planning in relation to an organization's workforce including researching requirements, developing objectives and strategies, implementing initiatives and monitoring and evaluating trends. It applies to individuals who are human resource managers or staff members with a role in a policy or planning unit that focuses on workforce planning.

Duration: 30 Hours

Theory: 6 Hours

Practice: 24 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Research workforce requirements	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Review current data on staff turnover and demographics • Assess factors that may affect workforce supply • Establish the organization's requirements for a skilled and diverse workforce 	Outline industrial relations relevant to the specific industry	<p>Theory- 2 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia 	Class Room



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				projector	
LU2. Develop workforce objectives and strategies	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Review organizational strategy and establish aligned objectives for modification or retention of the workforce • Consider strategies to address unacceptable staff turnover, if required • Define objectives to retain required skilled labor • Define objectives for workforce diversity and cross-cultural management • Define strategies to source skilled labor • Communicate objectives and rationale to relevant stakeholders 	<p>Explain current information about external labor supply relevant to the specific industry or skill requirements of the organization</p>	<p>Theory- 2 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	Class Room



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	<ul style="list-style-type: none"> Obtain agreement and endorsement for objectives and establish targets Develop contingency plans to cope with extreme situations 				
<p>LU3.</p> <p>Implement initiatives to support workforce planning objectives</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Implement action to support agreed objectives for recruitment, training, redeployment and redundancy Develop and implement strategies to assist workforce to deal with organizational change Develop and implement strategies to assist in meeting the organization's workforce diversity goals Implement succession planning system to ensure desirable workers are developed and retained 	<ul style="list-style-type: none"> Strategies to assist workforce to deal with organizational change & work environment 	<p>Theory- 1 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 7 Hrs.</p>	<ul style="list-style-type: none"> Internet MS Office Smartphone Laptop / Computer Smartphone Printer White board Projector screen Multimedia projector 	<p>Class Room</p>



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	<ul style="list-style-type: none"> Implement programs to ensure workplace is an employer of choice 				
<p>LU4.</p> <p>Monitor and evaluate workforce trends</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Review workforce plan against patterns in exiting employee and workforce changes Monitor labor supply trends for areas of over- or under-supply in the external environment Monitor effects of labor trends on demand for labor Survey organizational climate to gauge worker satisfaction Refine objectives and strategies in response to internal and external changes and make recommendations in response to global trends and 	<p>Describe labor force analysis and forecasting techniques</p>	<p>Theory- 1 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 7 Hrs.</p>	<ul style="list-style-type: none"> Internet MS Office Smartphone Laptop / Computer Smartphone Printer White board Projector screen Multimedia projector 	<p>Class Room</p>



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	<p>incidents</p> <ul style="list-style-type: none">• Regularly review government policy on labor demand and supply• Evaluate effectiveness of change processes against agreed objectives				
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Module-5: Undertake project work

Objective: After the completion of this competency standard, the Trainee will be able to undertake a straightforward project or a section of a larger project. It covers developing a project plan, administering and monitoring the project, finalizing the project and reviewing the project to identify lessons learned for application to future projects. This unit applies to individuals who play a significant role in ensuring a project meets timelines, quality standards, budgetary limits and other requirements set for the project.

Duration: 30 Hours

Theory: 6 Hours

Practice: 24 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Define project	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Access project scope and other relevant documentation • Define project stakeholders • Seek clarification from delegating authority of issues related to project and project parameters • Identify limits of own responsibility and reporting 	<p>Give examples of project management tools and how they contribute to a project</p> <p>Explain the organization's procedures and processes that are relevant to managing a project including:</p>	<p>Theory- 2 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	Class Room



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	<ul style="list-style-type: none"> • requirements • Clarify relationship of project to other projects and to the organization's objectives • Determine and access available resources to undertake project 	<ul style="list-style-type: none"> • <input type="checkbox"/> lines of authority and approvals • <input type="checkbox"/> quality assurance • <input type="checkbox"/> human resources • <input type="checkbox"/> budgets and finance • <input type="checkbox"/> recordkeeping • <input type="checkbox"/> reporting 			
<p>LU2.</p> <p>Develop project plan</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Develop project plan in line with the project parameters • Identify and access appropriate project management tools • Formulate risk management plan for project, including Work Health and Safety (WHS) • Develop and approve project budget • Consult team members and 	<ul style="list-style-type: none"> • Outline types of documents and other sources of information commonly used in defining the parameters of a project 	<p>Theory- 2 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	Class Room



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	<p>take their views into account in planning the project</p> <ul style="list-style-type: none"> Finalize project plan and gain necessary approvals to commence project according to documented plan 				
<p>LU3.</p> <p>Administer and monitor project</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Take action to ensure project team members are clear about their responsibilities and the project requirements Provide support for project team members, especially with regard to specific needs, to ensure that the quality of the expected outcomes of the project and document time lines are met Establish and maintain required recordkeeping 	<ul style="list-style-type: none"> Outline the organization's mission, goals, objectives and operations and how the project relates to them 	<p>Theory- 1 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 7 Hrs.</p>	<ul style="list-style-type: none"> Internet MS Office Smartphone Laptop / Computer Smartphone Printer White board Projector screen Multimedia projector 	<p>Class Room</p>



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	<p>systems throughout the project</p> <ul style="list-style-type: none"> • Implement and monitor plans for managing project finances, resources and quality • Complete and forward project reports as required to stakeholders • Undertake risk management as required to ensure project outcomes are met • Achieve project deliverables 				
<p>LU4.</p> <p>Finalize project</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Complete financial recordkeeping associated with project and check for accuracy • Ensure transition of staff involved in project to new roles or reassignment to previous roles • Complete project documentation and obtain 	<ul style="list-style-type: none"> • Explain processes for identifying and managing risk in a project 	<p>Theory- 1 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 7 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	<p>Class Room</p>



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	necessary sign-offs for concluding project				
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Module-6: Prepare and implement negotiation

Objective: After the completion of this competency standard, the Trainee will be able to prepare for and participate in a process of negotiation, Coordinate support services, Restore order, Provide leadership direction and guidance to the work group.

Duration: 30 Hours

Theory: 6 Hours

Practice: 24 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare for the negotiation	Trainee will be able to: <ul style="list-style-type: none"> • Identify objectives and preferred outcome of the negotiation and determine minimum acceptable outcome • Understand in relation to what can be offered and what is needed from the other party • Gather information regarding the other party – objectives, needs, preferences, resources, what they want to 	<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- 2 Hrs. Practical- 6 Hrs. Total- 8 Hrs.	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	Class Room



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	<p>achieve – in order to determine best negotiating points</p> <ul style="list-style-type: none">• List and rank the issues to consider concessions that may be made.• Find examples and refine negotiation argument• Check information to ensure it is correct and up-to-date.• Develop a negotiation plan that includes information about the other party and its interests and a set of responses and strategies to the anticipated tactics.• Prepare an agenda in advance, which includes discussion topics, participants, location and schedule				
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<p>LU2.</p> <p>Participate in negotiations</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 	<ul style="list-style-type: none"> • Outline the principles of effective communication 	<p>Theory- 1 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 7 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	<p>Class Room</p>
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	<p>consequences clearly and do an analysis of the benefits</p> <ul style="list-style-type: none"> • Reassess points of disagreements for common positive positions 				
<p>LU3.</p> <p>Coordinate support services</p>	<p>Trainee will be able to:</p> <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 	<p>Theory- 1 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 7 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	<p>Class Room</p>



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<p>LU4. Restore order</p>	<p>Trainee will be able to:</p> <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 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 	<ul style="list-style-type: none"> • Describe teamwork principles and strategies 	<p>Theory- 1 Hrs.</p> <p>Practical- 3 Hrs.</p> <p>Total-4 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	<p>Class Room</p>
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	the incident and the organizational response to it and report it promptly and accurately.				
LU5. Provide leadership direction and guidance to the work group	Trainee will be able to: <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 	<ul style="list-style-type: none"> • Outline the guidelines for use of equipment and technology • Explain code of conduct 	Theory- 1 Hrs. Practical- 3 Hrs. Total-4 Hrs.	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	Class Room



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	<p>function</p> <ul style="list-style-type: none">• 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 the task				
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Module-7: Manage Schedule and Meetings

Objective: After the completion of this competency standard, the Trainee will be able to manage a range of meetings including overseeing the meeting preparation processes, chairing meetings, organizing the minutes and reporting meeting outcomes. It applies to individuals employed in a range of work environments who are required to organize and manage meetings within their workplace, including conducting or managing administrative tasks in providing agendas and meeting material. They may work as senior administrative staff or may be individuals with responsibility for conducting and chairing meetings in the workplace

Duration: 30 Hours

Theory: 6 Hours

Practice: 24 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare for meetings	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Develop agenda in line with stated meeting purpose Ensure style and structure of meeting are appropriate to its purpose Identify meeting participants 	<ul style="list-style-type: none"> Outline responsibilities of the chairperson and explain group dynamics in relation to managing meetings 	<p>Theory- 2 Hrs. Practical- 6 Hrs. Total- 8 Hrs.</p>	<ul style="list-style-type: none"> Internet MS Office Smartphone Laptop / Computer Smartphone Printer White board 	Class Room



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	<p>and notify them in accordance with organizational procedures</p> <ul style="list-style-type: none"> • Confirm meeting arrangements in accordance with requirements of meeting • Dispatch meeting papers to participants within designated timelines 			<ul style="list-style-type: none"> • Projector screen • Multimedia projector 	
LU2. Conduct meetings	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Chair meetings in accordance with organizational requirements, agreed conventions for type of meeting and legal and ethical requirements • Conduct meetings to ensure they are focused, time efficient and achieve the required outcomes • Ensure meeting facilitation enables participation, discussion, problem solving and resolution of 	<ul style="list-style-type: none"> • Describe options for meetings including face-to-face, tele-conferencing, web-conferencing, and using webcams 	<p>Theory- 1 Hrs. Practical- 6 Hrs. Total- 7 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	Class Room



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	<p>issues</p> <ul style="list-style-type: none"> Brief minute-taker on method for recording meeting notes in accordance with organizational requirements and conventions for type of meeting 				
LU3. Follow up meetings	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Check transcribed meeting notes to ensure they reflect a true and accurate record of the meeting and are formatted in accordance with organizational procedures and meeting conventions Distribute and store minutes and other follow-up documentation within designated timelines, and according to organizational requirements Report outcomes of meetings as required, within designated timelines 	<ul style="list-style-type: none"> Devise meeting terminology, structures, arrangements as per organizational procedures 	<p>Theory- 1 Hrs. Practical- 6 Hrs. Total- 7 Hrs.</p>	<ul style="list-style-type: none"> Internet MS Office Smartphone Laptop / Computer Smartphone Printer White board Projector screen Multimedia projector 	Class Room



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<p>LU4.</p> <p>Establish schedule requirements</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Identify organizational requirements and protocols for diaries and staff planning tools • Identify organizational procedures for different types of appointments • Determine personal requirements for diary and schedule items for individual personnel • Establish appointment priorities and clarify in discussion with individual personnel 	<ul style="list-style-type: none"> • Identify the key provisions of relevant legislation, standards and codes that affect aspects of business operations or the achievement of team goals • Describe organizational requirements for managing appointments for personnel within the organization 	<p>Theory- 2 Hrs.</p> <p>Practical- 6 Hrs.</p> <p>Total- 8 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	<p>Class Room</p>
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Module-8: Identify and communicate trends in career development

Objective: After the completion of this competency standard, the Trainee will be able to conduct research to identify and communicate career trends. It establishes the need to interact professionally with others in assessing career needs, to effectively assist clients identify competencies they require for a career and employability in a given context. It also examines how to maintain quality of career development services and professional practice. It applies to individuals seeking to identify and communicate trends in career development.

Duration: 30 Hours

Theory: 6 Hours

Practice: 24 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Research and confirm career trends	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Apply knowledge of changing organizational structures, lifespan of careers and methods of conducting work search, recruitment and selection processes 	<ul style="list-style-type: none"> Explain client care and counseling techniques and processes in the context of career development services Describe diversity and its potential effects on career 	<p>Theory- 2 Hrs.</p> <p>Practical- 8 Hrs.</p> <p>Total- 10 Hrs.</p>	<ul style="list-style-type: none"> Internet MS Office Smartphone Laptop / Computer Smartphone Printer White board Projector screen 	Class Room



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	<ul style="list-style-type: none"> • Analyze changing worker and employer issues, rights and responsibilities in context of changing work practices • Examine importance of quality careers development services • Maintain all research, documentation, sources and references (electronic or physical) to a high degree of currency and relevance • Analyze implications of relevant policy, legislation, professional codes of practice and national standards relating to worker and employer issues • Research changes and trends in theory of career development counseling and practice • Confirm clusters, levels and combinations of transferable 	<p>choices</p> <ul style="list-style-type: none"> • Outline relevant policy, legislation, codes of practice and standards relevant to career development • Explain recruitment and selection processes in the context of career development services 		<ul style="list-style-type: none"> • Multimedia projector 	
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	employability skills and preferences that may open employment options spanning more than one occupation or career pathway				
LU2. Assess and confirm ongoing career development needs of target group	Trainee will be able to: <ul style="list-style-type: none"> • Analyze history and records in assessing needs of target group • Assess success of previous career development services and techniques used for individual or target group • Deploy other means to investigate appropriate care and counseling approaches as required • Maintain privacy, security of all data, research, personal records according to relevant policy, legislation, professional codes of practice 	<ul style="list-style-type: none"> • Outline human psychological development and needs in relation to careers development 	Theory- 2 Hrs. Practical- 8 Hrs. Total- 10 Hrs.	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	Class Room



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	<p>& national standards</p> <ul style="list-style-type: none"> Establish existing work-life balance requirements, issues and needs 				
<p>LU3.</p> <p>Maintain quality of career development services and professional practice</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Analyze and review relevance of career theories, models, frameworks, and research for target group Incorporate into career development services and professional practice, major changes and trends influencing workplace and career-related options and choices Comply with all relevant policy, legislation, professional codes of practice that influence delivery of career development services 	<ul style="list-style-type: none"> Describe a range of data gathering and research techniques Explain techniques used to analyze trends. 	<p>Theory- 2 Hrs.</p> <p>Practical- 8 Hrs.</p> <p>Total- 10 Hrs.</p>	<ul style="list-style-type: none"> Internet MS Office Smartphone Laptop / Computer Smartphone Printer White board Projector screen Multimedia projector 	<p>Class Room</p>



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Module-9: Apply specialist interpersonal and counseling interview skills

Objective: After the completion of this competency standard, the Trainee will be able to use advanced and specialized communication skills in the client-counselor relationship. This unit applies to individuals whose job role involves working with clients on personal and psychological issues within established policies, procedures and guidelines.

Duration: 30 Hours

Theory: 6Hours

Practice: 24 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Communicate effectively	Trainee will be able to: <ul style="list-style-type: none"> Identify communication barriers and use strategies to overcome these barriers in the client-counselor relationship 	Legal and ethical considerations for communication in counseling practice, and how these are applied	Theory- 2 Hrs. Practical- 8 Hrs. Total- 10 Hrs.	<ul style="list-style-type: none"> Internet MS Office Smartphone Laptop / Computer Smartphone Printer 	Class Room



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	<ul style="list-style-type: none"> • Facilitate the client-counselor relationship through selection and use of micro skills • Integrate the principles of effective communication into work practices • Observe and respond to non-verbal communication cues • Consider and respond to the impacts of different communication techniques on the client-counselor relationship in the context of individual clients • Integrate case note taking with minimum distraction 	<p>in individual practice:</p> <ul style="list-style-type: none"> • <input type="checkbox"/> codes of conduct/practice • <input type="checkbox"/> discrimination • <input type="checkbox"/> duty of care • <input type="checkbox"/> human rights • <input type="checkbox"/> practitioner/client boundaries • <input type="checkbox"/> privacy, confidentiality and disclosure • <input type="checkbox"/> rights and responsibilities of workers, employers and clients • <input type="checkbox"/> work role boundaries responsibilities and limitations of the counselor role • <input type="checkbox"/> work health and safety <p>Principles of person-centered practice</p>		<ul style="list-style-type: none"> • White board • Projector screen • Multimedia projector 	
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		<p>Communication techniques and micro-skills including:</p> <ul style="list-style-type: none">• <input type="checkbox"/> attending behaviors active listening, reflection of content feeling, summarizing• <input type="checkbox"/> questioning skills open, closed, simple and compound questions• <input type="checkbox"/> client observation skills• <input type="checkbox"/> noting and reflecting skills• <input type="checkbox"/> providing client feedback <p>Specialized counseling communication techniques, and how they are used, including:</p> <ul style="list-style-type: none">• <input type="checkbox"/> challenging• <input type="checkbox"/> reframing			
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		<ul style="list-style-type: none">• <input type="checkbox"/> focusing <p>K8: components of the communication process including:</p> <ul style="list-style-type: none">• <input type="checkbox"/> encoder• <input type="checkbox"/> decoder <p>Obstacles to the counseling process</p> <p>Self-evaluation practices, including:</p> <ul style="list-style-type: none">• <input type="checkbox"/> how to recognize own biases• <input type="checkbox"/> Impact of own values on the counseling relationship.			
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<p>LU2.</p> <p>Use specialized counseling interviewing skills</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Select and use communication skills according to the sequence of a counseling interview • Identify points at which specialized counseling interviewing skills are appropriate for inclusion • Use specialized counseling communication techniques based on their impacts and potential to enhance client development and growth • Identify and respond appropriately to strong client emotional reactions 	<ul style="list-style-type: none"> • Key objectives of counseling interview • Stages of a counseling interview • Potential impacts of using different communication skills and techniques in counseling contexts 	<p>Theory- 2 Hrs.</p> <p>Practical- 8 Hrs.</p> <p>Total- 10 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone • Printer • White board • Projector screen • Multimedia projector 	<p>Class Room</p>
<p>LU3.</p> <p>Evaluate own communication</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Reflect on and evaluate own communication with clients • Recognize the effect of own values and beliefs on 	<p>Impacts of trauma and stress on the communication process, including on:</p> <ul style="list-style-type: none"> • <input type="checkbox"/> concentration and attention 	<p>Theory- 2 Hrs.</p> <p>Practical- 8 Hrs.</p>	<ul style="list-style-type: none"> • Internet • MS Office • Smartphone • Laptop / Computer • Smartphone 	<p>Class Room</p>



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	<p>communication with clients</p> <ul style="list-style-type: none">• Identify and respond to the need for development of own skills and knowledge	<ul style="list-style-type: none">• <input type="checkbox"/> memory• <input type="checkbox"/> use of verbal and written language• <input type="checkbox"/> use of body language• <input type="checkbox"/> challenging within the counseling session <p>Observational techniques including:</p> <ul style="list-style-type: none">• <input type="checkbox"/> facial expressions• <input type="checkbox"/> non-verbal behavior• <input type="checkbox"/> posture• <input type="checkbox"/> silence <p>Ways in which different people absorb information, including:</p> <ul style="list-style-type: none">• <input type="checkbox"/> visual• <input type="checkbox"/> auditory• <input type="checkbox"/> kinesthetic	Total- 10 Hrs.	<ul style="list-style-type: none">• Printer• White board• Projector screen• Multimedia projector	
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		<p>K10: communication barriers and resolution strategies, including:</p> <ul style="list-style-type: none">• <input type="checkbox"/> environmental• <input type="checkbox"/> physical• <input type="checkbox"/> individual perceptions• <input type="checkbox"/> cultural issues• <input type="checkbox"/> language• <input type="checkbox"/> age issues• <input type="checkbox"/> disability <p>K9: primary factors that impact on the communication process including:</p> <ul style="list-style-type: none">• <input type="checkbox"/> context• <input type="checkbox"/> participants• <input type="checkbox"/> rules• <input type="checkbox"/> messages• <input type="checkbox"/> noise• <input type="checkbox"/> feedback			
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11. 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



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- Stainless steel Auger
- Sterilized containers
- Stopwatch
- 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
- Sieve Analysis Equipment
- Spatula
- Registers
- Filtration assembly



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- Labelling materials
- Trowel
- Oven
- Vacuum extraction pump

Analytical Tools and glass wares

- Beaker
- Burette
- China Dish
- Conical flask
- Crucible
- Cylinder (From 10 ml to 1L)
- Dropper
- Filter Paper
- Funnel
- Indicator dropper
- Measuring Flask
- Petri dishes



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- Pipette
- PPE
- Stirring rod
- Test Tube racks
- Test Tubes
- Tong
- Wash bottles
- Wash dishes

Equipment

- Atomic Absorption spectrophotometer
- Analytical Balance
- Auto clave
- Block digestion
- Dispenser
- EC meter



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- Exhaust hood
- Flame Photo meter
- Flow injection analyser
- Freezer
- Hot Plate
- Hot water bathtub
- Hydrometer
- Incubator
- Kjeldahl Unit
- Laminar flow
- Muffle Furnace
- Oven
- PH meter
- Reciprocating Shakers
- Refrigerator
- Shaker
- Spectro Photometer
- Vortex mixer
- Water Distillation Unit



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PPE

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



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12. 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



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6	Ms. Mahnoor Atique	MPhil Scholar, UET Lahore
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

13. Members of the Qualification Validation Committee

S#	Name	Designation
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1	Ms. Saadia Syed	DACUM Expert, PTEVTA
2	Mr. Muhammad Saeed Ahmed	Agriculture Officer, UVAS Pattoki
3	Dr. Asma Saeed	Chief Scientific Officer, PCSIR Labs. Complex Lahore
4	Dr. Naeem Abbas	Sr. Scientific Officer, PCSIR Labs. Complex Lahore
5	Dr. Sumaira Maqbool	Associate Professor, Punjab University, Lahore
6	Ms. Iqra Haider Khan	PhD Scholar, Punjab University, Lahore
7	Mr. Zia-ur-Rehman	Dy. Director Academics. KPK TEVTA



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8	Mr. Abdur Rehman	PBTE Representative, Lahore
9	Ms. Saima Akhtar	NRSP, UPAP, Faisalabad
10	Muhammad Ishaq	Deputy Director/ Coordinator – (TE) NAVTTC HQ