

## LABORATORY TECHNIQUES

**ISCED UNIT CODE:** 0711 451 07A

**TVETCDACC UNIT CODE:** ENV/CU/ENT/CC/03/5/MA

**UNIT DURATION:** 100 HOURS

### Relationship to Occupational Standards

This unit addresses the Unit of Competency: **Perform laboratory techniques**

### Unit Description

This unit covers the competencies required to perform laboratory techniques it involves maintaining laboratory safety, administering first aid, maintaining laboratory equipment, carrying out sample collection and preparing specimen samples

### Summary of Learning Outcomes

By the end of this unit the learner should be able to:

S/No	Learning Outcomes	Duration (Hours)
1.	Maintain laboratory safety	20
2.	Administer first aid	20
3.	Maintain laboratory equipment	20
4.	Carry out sample collection	20
5.	Prepare specimen samples	20
<b>Total</b>		<b>100</b>

### Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcomes	Content	Suggested Assessment Methods
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1. Maintain laboratory safety	<p><b>Theory</b></p> <p>1.1 Laboratory safety</p> <p>1.1.1. Define of terms</p> <p>1.1.1.1. Laboratory safety</p> <p>1.1.1.1.2. Risks,</p> <p>1.1.1.1.3. Hazards,</p> <p>1.1.1.1.4. PPEs</p> <p>1.1.2 Importance of Safety in Laboratories</p> <p>1.2 Sources of danger</p> <p>1.2.1 Types of Laboratory Hazards</p> <p>1.2.1.1 Chemical hazards</p> <p>1.2.1.2 Biological hazards</p> <p>1.2.1.3 Physical hazards</p> <p>1.2.1.4 Ergonomic hazards</p> <p>1.2.1.5 Equipment Hazards</p> <p>1.2.1.6 Fire and Explosion Risks</p> <p>1.2.2 Effects of laboratory hazards</p> <p>1.2.3 Ways of minimizing laboratory hazards</p> <p>1.3 Safety precaution measures</p> <p>1.3.1 Standard Operating Procedures (SOPs)</p> <p>1.3.2 Personal Protective Equipment (PPE) usage and maintenance</p> <p>1.3.3 Safe handling and storage of hazardous material</p> <p>1.3.4 Emergency procedures and first aid</p> <p>1.4 Laboratory occupational, health and safety operation policy</p> <p>1.4.1 laboratory safety policy</p> <p>1.4.2 Policy implementation and communication</p> <p>1.4.3 Safety audits and inspection</p>	<ul style="list-style-type: none"> <li>• Practical</li> <li>• Written tests</li> <li>• Individual/group assignment</li> <li>• Projects</li> <li>• Interviews/ Oral questions</li> <li>• Third party</li> <li>• Case Studies</li> </ul>
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	<p>1.4.4 Training and education of lab personnel</p> <p>2.2 laboratory Accidents</p> <p>2.2.1 Types of laboratory accidents</p> <p>2.2.1.1 Chemical spillage or exposure</p> <p>2.2.1.2 Biological exposure</p> <p>2.2.1.3 Physical injuries</p> <p>2.2.1.4 Equipment malfunctions</p> <p>2.2.1.5 Fire and explosions</p> <p>2.2.2 Immediate response procedures</p> <p>2.2.3 Reporting and documentations</p> <p>2.2.4 Accident review and prevention actions</p> <p><b>Practice</b></p> <p>2.3 Conducting risk assessments</p> <p>1.6.1 Identification of Hazards in the laboratory</p> <p>1.6.2 Risk evaluation</p> <p>1.6.3 Control measures</p> <p>1.7 Review of historical lab accidents and lessons learned</p> <p>1.7.1 Incident Selection</p> <p>1.7.2 Detailed Analysis</p> <p>1.7.3 Preventive measures</p> <p>1.7.4 Application preventive measures</p>	
2. Administer first aid	<p><b>Theory</b></p> <p>2.5 First Aid</p> <p>2.1.1 Definition of terms</p> <p>2.1.1.1 First Aid</p> <p>2.1.1.2 First aid kit</p> <p>2.1.2 Types of first aid kits</p> <p>2.1.3 Contents of a Standard First Aid Kit</p>	<ul style="list-style-type: none"> <li>• Practical</li> <li>• Written tests</li> <li>• Individual/group assignment</li> <li>• Projects</li> <li>• Interviews/ Oral questions</li> </ul>

	<p>2.6 First aid administration</p> <p>2.2.1 Basic First Aid Procedures:</p> <p>2.3.3.1 Treating cuts, burns, and chemical exposures</p> <p>2.3.3.2 CPR and emergency response</p> <p>2.3.3.3 Handling chemical spills and exposure</p> <p>2.3.3.4 Treating thermal burns and electrical shocks</p> <p>2.3.3.5 Importance of first aid administration</p> <p>2.4 First aid communication</p> <p>2.4.1 Define first aid communication</p> <p>2.4.2 Channel of communication</p> <p>2.4.3 Importance of first aid communication</p> <p><b>Practice</b></p> <p>2.5 Simulated Emergency Scenarios:</p> <p>2.5.1 Mock drills for chemical spills, burns, and injuries</p> <p>2.5.2 Role-playing exercises</p> <p>2.6 Feedback and Improvement:</p> <p>2.6.1 Debriefing sessions after drills</p> <p>2.6.2 Continuous improvement based on feedback</p>	<ul style="list-style-type: none"> <li>• Third party</li> <li>• Case Studies</li> </ul>
3.Maintain laboratory equipment's	<p><b>Theory</b></p> <p>3.1 Laboratory Equipment</p> <p>3.1.1 Laboratory equipment's calibration</p>	<ul style="list-style-type: none"> <li>• Practical</li> <li>• Written tests</li> <li>• Individual/group assignment</li> </ul>

	<p>3.1.1.1 Definition of lab equipment's calibration</p> <p>3.1.1.2 Importance of calibration</p> <p>3.1.1.3 Common Laboratory equipment requiring calibration</p> <p>3.2 Calibration Procedures</p> <p>3.2.1 Calibration processes</p> <p>3.2.2 Maintaining calibration logs</p> <p>3.2.3 Traceability and compliance with regulations</p> <p>3.3 Servicing laboratory equipment</p> <p>3.3.1 Types of maintenance</p> <p>3.3.1.1 Preventive maintenance</p> <p>3.3.1.2 Corrective maintenance</p> <p>3.3.1.3 Importance of servicing</p> <p>3.4 Cleaning of laboratory equipment's</p> <p>3.4.1 Types of contaminants in a laboratory</p> <p>3.4.2 Importance of regular cleaning</p> <p>3.4.3 Cleaning procedure</p> <p>3.4.4 Handling and disposing of cleaning waste</p> <p><b>Practice</b></p> <p>3.5 Calibrate various laboratory instruments</p> <p>3.5.1 Glassware</p> <p>3.5.2 Heating Equipment</p> <p>3.5.3 Analytical Instruments</p> <p>3.5.4 Safety Equipment</p> <p>3.5.5 Real-time troubleshooting</p>	<ul style="list-style-type: none"> <li>• Projects</li> <li>• Interviews/ Oral questions</li> <li>• Third party</li> <li>• Case Studies</li> </ul>
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4 carry out sample collection	<p>4.1 Laboratory sample collection</p> <p>4.1.1 Types of sample collection</p> <p>4.1.2 Importance of sample collection</p> <p>4.1.3 Procedures of collecting laboratory samples</p> <p>4.2 Sample storage procedures and requirements</p> <p>4.2.1 Importance of storing laboratory samples</p> <p>4.2.2 Types of samples and storage requirements</p> <p>4.2.2.1 Biological samples</p> <p>4.2.2.2 Environmental samples</p> <p>4.3 Sample storage conditions</p> <p>4.3.1 Temperature and humidity control</p> <p><b>Practice</b></p> <p>4.4 Collection Simulation</p> <p>4.5 Conducting mock sample collections</p> <p>4.6 Practice labelling and storage</p>	<ul style="list-style-type: none"> <li>• Practical</li> <li>• Written tests</li> <li>• Individual/group assignment</li> <li>• Projects</li> <li>• Interviews/ Oral questions</li> <li>• Third party</li> <li>• Case Studies</li> </ul>
5 Prepare specimen samples	<p style="text-align: center;"><b>Theory</b></p> <p>5.1 Specimen sample preparation</p> <p>5.1.1 Types of specimens and their uses</p> <p>5.1.1.1 Water Samples</p> <p>5.1.1.2 Soil Samples</p> <p>5.1.1.3 Air Samples</p> <p>5.1.1.4 Biological Samples</p> <p>5.2 Methods of preparing different types of specimens</p>	<ul style="list-style-type: none"> <li>• Practical</li> <li>• Written tests</li> <li>• Individual/group assignment</li> <li>• Projects</li> <li>• Interviews/ Oral questions</li> <li>• Third party</li> <li>• Case Studies</li> </ul>

	<p style="text-align: center;"><b>Practice</b></p> <p>5.3 Carry out Samples preparation</p> <p style="padding-left: 40px;">5.3.1 Specimen Handling</p> <p style="padding-left: 40px;">5.3.2 Preparation Techniques</p> <p style="padding-left: 40px;">5.3.3 Safety Measures</p> <p>5.4 Specimen experimental findings</p> <p style="padding-left: 40px;">5.4.1 Data Recording Methods</p> <p style="padding-left: 40px;">5.4.2 Reporting Results</p>	
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### Suggested Methods of Instruction

- Demonstration
- Role playing
- Group discussion
- Direct instruction

### Recommended Resources for 25 trainees

S/No.	Category/Item	Description/Specifications	Quantity	Recommended Ratio (Item: Trainee)
<b>A</b>	<b>Learning Materials</b>			
1.)	Waste Storage		10 pcs	1:3
2.)	Khaki bags		25 pcs	1.1
3.)	Plastic bags		25 pcs	1.1
<b>B</b>	<b>Learning Facilities &amp; infrastructure</b>			
1.)	Lecture/theory room		1	1:25
2.)	Laboratory		1	1:25
<b>C</b>	<b>Tools and Equipment</b>			

1.)	Centrifuges		25 pcs	1:1
2.)	Refrigeration		5 pcs	1:5
3.)	Microscopes		5 pcs	1:5
4.)	Heating Equipment		25 pcs	1:1
5.)	Analytical Instruments		5 pcs	1:5
6.)	Safety Equipment		25 pcs	1:1
7.)	pH Meters and Conductivity Meters		25 pcs	1:1

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