

## BIOLOGICAL TECHNIQUES

**UNIT CODE: 0511 441 04A**

**TVET CDACC UNIT CODE:** SLT/CU/SL/CR/03/5/MA

**UNIT DURATION:** 180 Hours

### **Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Perform Biology Techniques

### **Unit Description**

This unit specifies the competencies required to Perform Biology Techniques. It involves performing cytological test, performing food test, Care for laboratory animals and carrying out microbiological techniques. It also entails carrying out herbarium techniques, carrying out museum techniques and conducting ecological experiments.

### **Summary of Learning Outcomes**

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

S/No	Learning Outcomes	Duration (Hours)
1.	Perform cytological test	20
2.	Perform food test	20
3.	Carry out microbiological techniques	50
4	Care for laboratory animals	20
5	Carry out herbarium techniques	20
6	Cary out museum techniques	20
7	Conduct ecological experiments	30
	<b>Total</b>	<b>180</b>

### **Learning Outcomes, Content and Suggested Assessment Methods**

Learning Outcome	Content	Suggested Assessment Methods
1. Perform cytological test	<p>1.1 Identification of plant and animal cells and tissues and their structures.</p> <p>1.2 Isolation and staining of plant and animal cells.</p> <p>1.3 Microscopy and micrometry.</p> <p>1.4 Types of microscopes</p> <ul style="list-style-type: none"> <li>1.4.1 Fluorescent microscope</li> <li>1.4.2 Bright field microscope</li> <li>1.4.3 Dark ground microscope</li> <li>1.4.4 Electron microscope</li> <li>1.4.5 Phase contrast microscope</li> <li>1.4.6 Dissecting microscope</li> </ul> <p>1.5 Movement of substances in and out of the cell:</p> <ul style="list-style-type: none"> <li>1.5.1 Exocytosis</li> <li>1.5.2 Endocytosis</li> </ul> <p>1.6 Preparation of solutions of various concentrations to demonstrate diffusion and osmosis</p> <p>1.7 Active transport:</p> <ul style="list-style-type: none"> <li>1.7.1 Primary active transport</li> <li>1.7.2 Secondary active transport</li> </ul> <p>1.8 Cell division</p> <ul style="list-style-type: none"> <li>1.8.1 Mitosis</li> <li>1.8.2 Meiosis</li> </ul>	<ul style="list-style-type: none"> <li>• Practical test</li> <li>• Portfolio of evidence</li> <li>• Written tests</li> <li>• Third party report</li> <li>• Oral questioning</li> </ul>

2. Perform food test	<p>2.1 Apparatus used for food test.</p> <p>2.2 Preparation of reagents used for food test</p> <ul style="list-style-type: none"> <li>2.2.1 Test for reducing sugars</li> <li>2.2.2 Test for non-reducing sugars</li> <li>2.2.3 Test for proteins</li> <li>2.2.4 Test for starch</li> <li>2.2.5 Test for vitamin C (Ascorbic acid)</li> <li>2.2.6 Test for lipids</li> </ul> <p>2.3 Laboratory practical report writing.</p>	<ul style="list-style-type: none"> <li>3 Practical test</li> <li>4 Portfolio of evidence</li> <li>5 Written tests</li> <li>6 Third party report</li> <li>7 Oral questioning</li> </ul>
3. Carry out microbiological techniques	<p>3.1 Types of microorganisms:</p> <ul style="list-style-type: none"> <li>3.1.1 Bacteria</li> <li>3.1.2 Fungi</li> <li>3.1.3 Protozoa</li> <li>3.1.4 Viruses</li> </ul> <p>3.2 Aseptic techniques</p> <p>3.3 Sterilization techniques</p> <ul style="list-style-type: none"> <li>3.3.1 Dry heat</li> <li>3.3.2 Wet heat</li> <li>3.3.3 Radiation.</li> </ul> <p>3.4 Preparation of culture media:</p> <ul style="list-style-type: none"> <li>3.4.1 Agar</li> <li>3.4.2 Broth</li> </ul> <p>3.5 Types of culture media</p> <ul style="list-style-type: none"> <li>3.5.1 Basal media</li> <li>3.5.2 Enriched media</li> <li>3.5.3 Selective media</li> <li>3.5.4 Enrichment media</li> <li>3.5.5 Transport media</li> <li>3.5.6 Storage media</li> </ul> <p>3.6 Culture of microorganisms</p> <p>3.7 Preparation and observation of bacterial smears</p> <p>3.8 Disposal of pathogenic materials.</p>	<ul style="list-style-type: none"> <li>• Practical test</li> <li>• Portfolio of evidence</li> <li>• Written tests</li> <li>• Third party report</li> <li>• Oral questioning</li> </ul>

4. Care for laboratory animals	<p>4.1 Types of laboratory animals.</p> <p>4.1.1 Rats</p> <p>4.1.2 Guinea pigs</p> <p>4.1.3 Rabbits</p> <p>4.1.4 Mongolian gerbil</p> <p>4.1.5 Hamsters</p> <p>4.1.6 Insects</p> <p>4.1.7 Birds</p> <p>4.2 Housing, feeding and handling of laboratory animals</p> <p>4.3 Humane killing of laboratory animals:</p> <p>4.3.1 Physical methods</p> <p>4.3.2 Chemical methods</p> <p>4.3.3 Electrical methods</p> <p>4.4 Dissection of laboratory animals</p> <p>4.5 Diseases and pests' control in an animal house.</p> <p>4.5.1 Bacterial diseases</p> <p>4.5.2 Fungal diseases</p> <p>4.5.3 Viral diseases</p> <p>4.5.4 Protozoan diseases</p> <p>4.6 Methods of disposal of carcasses.</p> <p>4.6.1 Incineration.</p> <p>4.6.2 Burying.</p> <p>4.6.3 Preservation.</p>	<p>5 Practical test</p> <p>6 Portfolio of evidence</p> <p>7 Written tests</p> <p>8 Third party report</p> <p>9 Oral questioning</p>
5. Carry out herbarium technique	<p>5.1 Tools for plant specimen collection:</p> <p>5.1.1 Cutting tools</p> <p>5.1.2 Digging tools</p> <p>5.1.3 Collection bags</p> <p>5.1.4 Field stationery</p> <p>5.1.5 Plant press</p> <p>5.1.6 Blotting papers</p> <p>5.2 Methods of collecting of plant specimens.</p> <p>5.2.1 Weeding</p> <p>5.2.2 Pruning</p> <p>5.2.3 Irrigation</p>	<p>10 Practical test</p> <p>11 Portfolio of evidence</p> <p>12 Written tests</p> <p>13 Third party report</p> <p>14 Oral questioning</p>

	<p>5.3 Pest control</p> <p>5.3.1 Planting</p> <p>5.4 Types of herbarium specimen.</p> <p>5.4.1 Leaves</p> <p>5.4.2 Roots</p> <p>5.4.3 Flowers</p> <p>5.4.4 Fruits</p> <p>5.4.5 Whole plants</p> <p>5.4.6 Seeds</p> <p>5.4.7 Stems</p> <p>5.5 Preservation of plant specimens</p> <p>5.6 Labelling, Storage and display of plant specimens</p>	
6. Carry out museum technique	<p>6.1 Collection of museum specimen.</p> <p>6.2 Tools used for museum specimen collection.</p> <p>6.2.1 Museum jars</p> <p>6.2.2 Killing jars</p> <p>6.2.3 Pouter</p> <p>6.2.4 Nets</p> <p>6.2.5 Traps</p> <p>6.2.6 Field stationeries</p> <p>6.2.7 Collection bags</p> <p>6.2.8 Pair of tongs and forceps</p> <p>6.3 Types of museum specimen.</p> <p>6.3.1 Arthropods</p> <p>6.3.2 Mammals</p> <p>6.3.3 Reptiles</p> <p>6.3.4 Birds</p> <p>6.3.5 Plants</p> <p>6.3.6 Fish</p> <p>6.3.7 Annelids</p> <p>6.4 Preservation of animal specimen.</p> <p>6.5 Labelling, Storage and display of animal specimen.</p>	<ul style="list-style-type: none"> <li>• Practical test</li> <li>• Portfolio of evidence</li> <li>• Written tests</li> <li>• Third party report</li> <li>• Oral questioning</li> </ul>
7. Conduct ecological experiments	<p>7.1 Terminologies used in ecology</p> <p>7.1.1 Species</p>	<p>7 Practical test</p> <p>8 Portfolio of evidence</p>

	<p>7.1.2 Habitat</p> <p>7.1.3 Population</p> <p>7.1.4 Community</p> <p>7.1.5 Niche</p> <p>7.1.6 Ecosystem</p> <p>7.1.7 Biome</p> <p>7.1.8 Biosphere</p> <p>7.1.9 Energy transfer in ecosystem</p> <p>7.2 Ecological equipment</p> <p>7.2.1 Quadrats</p> <p>7.2.2 Nets</p> <p>7.2.3 Tape measure</p> <p>7.2.4 Ropes and strings</p> <p>7.2.5 Marker pens</p> <p>7.2.6 Instruments of measuring elements of weather</p> <p>7.3 Use and care of ecological equipment</p> <p>7.4 Identification of Biotic factors</p> <p>7.5 Ecological interactions</p> <p>7.5.1 Symbiosis</p> <p>7.5.2 Competition</p> <p>7.5.3 Parasitism</p> <p>7.5.4 Commensalism</p> <p>7.5.5 Predation</p> <p>7.6 Identification of Abiotic factors.</p> <p>7.7 Population estimation methods.</p>	<p>9 Written tests</p> <p>10 Third party report</p> <p>11 Oral questioning</p>
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### Suggested Methods of Instruction

- Demonstration
- Viewing of related videos
- Discussion
- Direct Instruction
- Field excursion

### Recommended Resources for 25 Trainees

S/No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio  (Item: Trainee)
<b>A</b>	<b>Learning Materials</b>			
1.	Power point presentations	For trainer's use	1	1:25
2.	Computer	For trainer's use	1	1:25
3.	Projector	For trainer's use	1	1:25
4.	Standard manuals/SOPs	For trainer's use	1	1:25
5.	Flip charts	For trainer's use	1	1:25
<b>B</b>	<b>Learning Facilities &amp; infrastructure</b>			
6.	Lecture/theory room			
7.	Fully equipped science laboratory	For trainee use	1	1:25
8.	Lecture room	For trainee use	1	1:25
<b>C</b>	<b>Consumable materials</b>			
9.	Stationeries	For trainee use	25	1:1
10.	Gloves	For trainee use	25	1:1
11.	Laboratory coats	For trainee use	25	1:1
12.	Masks	For trainee use	25	1:1
13.	laboratory animals (rats)	For trainee use	5	1:5
14.	Dissecting kit	For trainee use	5	1:5
15.	Dissecting board	For trainee use	5	1:5
16.	Covers slips	For trainee use	5	1:5
17.	Glass slides	For trainee use	5	1:5
<b>D</b>	<b>Tools and Equipment</b>			
18.	Compound light microscope	For trainee use	5	1:5