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**THE REPUBLIC OF KENYA**

**NATIONAL OCUPATIONAL STANDARDS**

**FOR**

**BIOTECHNICIAN**

**LEVEL 5**



TVET CDACC

P.O. BOX 15745-00100

NAIROBI

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**Council Secretary/CEO**

**TVET Curriculum Development, Assessment and Certification Council**

**P.O. Box 15745–00100**

**Nairobi, Kenya**

**Email: info@tvetcdacc.go.ke**

# FOREWORD

The provision of quality education and training is fundamental to the Government’s overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya’s development blueprint, Vision 2030 and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned in the Constitution of Kenya 2010 and this resulted to the formulation of the Policy Framework for Reforming Education and Training. A key feature of this policy is the radical change in the design and delivery of the TVET training. This policy document requires that training in TVET be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery allows for multiple entry and exit in TVET programmes.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that these Occupational Standards were developed for developing a competency-based curriculum for Bio Technology level 5. These Occupational Standards will also be the basis for assessment of an individual for competence certification.

It is my conviction that these Occupational Standards will play a great role towards development of competent human resource for the Biotechnology sector’s growth and development.

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING**

**MINISTRY OF EDUCATION**

# PREFACE

Kenya Vision 2030 aims to transform the country into a newly industrializing, “middle-income country providing a high-quality life to all its citizens by the year 2030”. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency Based Education and Training (CBET).

The Technical and Vocational Education and Training Act No. 29 of 2013 and Sessional Paper No. 14 of 2016 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labor force.

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Biotechnology Sector Skills Advisory Committee (SSAC) have developed these Occupational Standards for Bio technician. These standards will be the basis for development of competency-based curriculum for Bio Technology level 5.

The occupational standards are designed and organized with clear performance criteria for each element of a unit of competency. These standards also outline the required knowledge and skills as well as evidence guide.

I am grateful to the Council Members, Council Secretariat, Biotechnology SSAC, expert workers and all those who participated in the development of these Occupational Standards.

**CHAIRPERSON,**

 **TVET CDACC**

# ACKNOWLEDGMENT

These Occupational Standards were developed through combined effort of various stakeholders from private and public organizations. I am thankful to the management of these organizations for allowing their staff to participate in this course. I wish to acknowledge the invaluable contribution of industry players who provided inputs towards the development of these Standards.

I thank TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) for providing guidance on the development of these Standards. My gratitude goes to Biotechnology Sector Skills Advisory Committee (SSAC) members for their contribution to the development of these Standards. I thank all the individuals and organizations who participated in the validation of these Standards.

My gratitude also goes to the Ministry of Industrialization and the industry experts who cooperated with TVET CDACC in the development of these Standards.

I acknowledge all other institutions which in one way or another contributed to the development of these Standards.

**CHAIRPERSON**

**BIOTECHNOLOGY SECTOR SKILLS ADVISORY COMMITTEE**

Table of Contents

[FOREWORD iii](#_Toc30413493)

[PREFACE iv](#_Toc30413494)

[ACKNOWLEDGMENT v](#_Toc30413495)

[ACRONYMS vii](#_Toc30413496)

[KEY TO UNIT CODE viii](#_Toc30413497)

[OVERVIEW ix](#_Toc30413498)

[BASIC UNITS OF COMPETENCY 1](#_Toc30413499)

[DEMONSTRATE COMMUNICATION SKILLS 2](#_Toc30413500)

[DEMONSTRATE NUMERACY SKILLS 7](#_Toc30413501)

[DEMONSTRATE DIGITAL LITERACY 14](#_Toc30413502)

[DEMONSTRATE ENTREPRENEURIAL SKILLS 20](#_Toc30413503)

[DEMONSTRATE EMPLOYABILITY SKILLS 25](#_Toc30413504)

[DEMONSTRATE ENVIRONMENTAL LITERACY 34](#_Toc30413505)

[DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES 41](#_Toc30413506)

[COMMON UNITS OF COMPETENCY 48](#_Toc30413507)

[DEMONSTRATE UNDERSTANDING OF BASIC BIOMETRICS 49](#_Toc30413508)

[DEMONSTRATE BASIC KNOWLEDGE OF CELL BIOLOGY & HISTOLOGY 53](#_Toc30413509)

[DEMONSTRATE BASIC KNOWLEDGE OF LABORATORY PRACTICE 58](#_Toc30413510)

[DEMONSTRATE UNDERSTANDING OF RESEARCH PROJECT 63](#_Toc30413511)

[CORE UNITS OF COMPETENCY 69](#_Toc30413512)

[PARTICIPATE IN BIOTECHNOLOGY RESEARCH ACTIVITIES 70](#_Toc30413513)

[PREPARE MEDIA SOLUTION 76](#_Toc30413514)

[MANAGE INDUSTRIAL WASTE 82](#_Toc30413515)

[IMPROVE ANIMAL PRODUCTION 87](#_Toc30413516)

[IMPROVE CROP PRODUCTION 93](#_Toc30413517)

[PROCESS QUALITY FOOD 98](#_Toc30413518)

[MAINTAIN BIOTECHNOLOGY LABORATORY 103](#_Toc30413519)

# **ACRONYMS AND ABBREVIATIONS**

MED Applied Science

BC Basic Unit of Competency

BT Biotechnology

CBET Competency Based Education and Training

CC Common Unit of Competency

CDACC Curriculum Development Assessment and Certification Council

CR Core Unit of Competency

CRD Complete Randomized Design

CV Coefficient Variation

DNA Deoxyribonucleic Acid

EMS Environment Management System

HSE Health Safety and Environment

KEVEVAPI Kenya Veterinary Vaccine Production Institute

NBA National Biosafety Authority

NEMA National Environmental Management Authority

OS Occupational Standards

OSHA Occupation Safety and Health Act

PPE Personal Protective Equipment

RCBD Randomized Complete Block Design

SES Standard Evaluation System

SOP Standard Operating Procedures

SSAC Sector Skills Advisory Committee

TVET Technical and Vocational Education and Training

# KEY TO UNIT CODE

 **MED/OS/BT/BC/01/5/A**

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Version Control

# OVERVIEW

The Biotechnician level 5 qualification consist of competencies that an individual must achieve to enable him/ her to be certified as a bio technician. These competencies include biotechnology research activities, prepare media solution, manage industrial waste, improve animal production, improve crop production, process quality food and maintain biotechnology laboratory.

**BASIC UNITS OF COMPETENCY**

|  |  |
| --- | --- |
| **UNIT CODE**  | **UNIT TITLE**  |
| MED/OS/BT/BC/01/5/A | Demonstrate communication skills |
| MED/OS/BT/BC/02/5/A | Demonstrate numeracy skills |
| MED/OS/BT/BC/03/5/A | Demonstrate digital literacy |
| MED/OS/BT/BC/04/5/A | Demonstrate entrepreneurial skills |
| MED/OS/BT/BC/05/5/A | Demonstrate employability skills |
| MED/OS/BT/BC/06/5/A | Demonstrate environmental literacy  |
| MED/OS/BT/BC/07/5/A | Demonstrate occupational safety and health practices  |

**COMMON UNITS OF COMPETENCY**

|  |  |
| --- | --- |
| **UNIT CODE**  | **UNIT TITLE**  |
| MED/OS/BT/CC/01/5/A | Demonstrate understanding of basic biometric  |
| MED/OS/BT/CC/02/5/A | Demonstrate basic knowledge of cell biology & histology |
| MED/OS/BT/CC/03/5/A | Demonstrate basic knowledge of laboratory practice  |
| MED/OS/BT/CC/04/5/A | Demonstrate understanding of research project |

**CORE UNITS OF COMPETENCY**

|  |  |
| --- | --- |
| **UNIT CODE**  | **UNIT TITLE**  |
| MED/OS/BT/CR/01/5/A | Participate in biotechnology research activities |
| MED/OS/BT/CR/02/5/A | Prepare media solution |
| MED/OS/BT/CR/03/5/A | Manage industrial waste |
| MED/OS/BT/CR/04/5/A | Improve animal production |
| MED/OS/BT/CR/05/5/A | Improve crop production |
| MED/OS/BT/CR/06/5/A | Process quality food |
| MED/OS/BT/CR/07/5/A | Maintain biotechnology laboratory |

# BASIC UNITS OF COMPETENCY

# DEMONSTRATE COMMUNICATION SKILLS

**UNIT CODE:** MED/OS/BT/BC/01/5/A

**UNIT DESCRIPTION**

This unit covers the competencies required to use specialized communication skills to meet specific needs of internal and external clients, conduct interviews, facilitate discussion with groups and contribute to the development of communication strategies.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Meet communication needs of clients and colleagues
 | 1. Specific communication needs of clients and colleagues are identified and met
2. Different approaches are used to meet communication needs of clients and colleagues
3. Conflict is addressed promptly and in a timely way and in a manner which does not compromise the standing of the organization
 |
| 1. Contribute to the development of communication strategies
 | * 1. Strategies for internal and external dissemination of information are developed, promoted, implemented and reviewed as required
	2. Channels of communication are established and reviewed regularly
	3. Coaching ineffective communication is provided
	4. Work related network and relationship are maintained as necessary
	5. Negotiation and conflict resolution strategies are used where required
	6. Communication with clients and colleagues is appropriate to individual needs and organizational objectives
 |
| 1. Conduct interviews
 | 1. A range of appropriate communication strategies are employed in ***interview situations***
2. Records of interviews are made and maintained in accordance with organizational procedures
3. Effective questioning, listening and nonverbal communication techniques are used to ensure that required message is communicated
 |
| 1. Facilitate group discussions
 | 1. Mechanisms which enhance effective group interaction is defined and implemented
2. Strategies which encourage all group members to participate are used routinely
3. Objectives and agenda for meetings and discussions are routinely set and followed
4. Relevant information is provided to group to facilitate outcomes
5. Evaluation of group communication strategies is undertaken to promote participation of all parties
6. Specific communication needs of individuals are identified and addressed
 |
| 1. Represent the organization
 | 1. When participating in internal or external forums, presentation is relevant, appropriately researched and presented in a manner to promote the organization
2. Presentation is clear and sequential and delivered within a predetermined time
3. Utilize appropriate media to enhance presentation
4. Differences in views are respected
5. Written communication is consistent with organizational standards
6. Inquiries are responded in a manner consistent with organizational standard
 |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| ***Communication strategies***include but not limited to: | * Language switch
* Comprehension check
* Repetition
* Asking confirmation
* Paraphrase
* Clarification request
* Translation
* Restructuring
* Approximation
* Generalization
 |
| ***Effective group interaction*** includes but not limited to: | * Identifying and evaluating what is occurring within an interaction in a non-judgmental way
* Using active listening
* Making decision about appropriate words, behavior
* Putting together response which is culturally appropriate
* Expressing an individual perspective
* Expressing own philosophy, ideology and background and exploring impact with relevance to communication
* Openness and flexibility in communication
 |
| ***Situations*** include but not limited to: | * Establishing rapport
* Eliciting facts and information
* Facilitating resolution of issues
* Developing action plans
* Diffusing potentially difficult situations
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Effective communication process
* Active listening
* Giving/receiving feedback
* Interpretation of information
* Role boundaries setting
* Negotiation
* Establishing empathy
* Openness and flexibility in communication
* Communication skills required to fulfill job roles as specified by the organization

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Communication process
* Dynamics of groups and different styles of group leadership
* Communication skills relevant to client groups
* Flexibility in communication
* Communication skills relevant to client groups

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate: 1. Met communication needs of clients and colleagues
2. Contributed to the development of communication strategies
3. Conducted interviews
4. Facilitated group discussions
5. Represented the organization
 |
| 1. Resource Implications
 | The following resources should be provided: 1. Access to relevant workplace or appropriately simulated environment where assessment can take place
2. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: 1. Direct Observation/Demonstration with Oral Questioning
2. Written Examination
 |
| 1. Context of Assessment
 | Competency may be assessed individually in the actual workplace or through accredited institution |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE NUMERACY SKILLS

**UNIT CODE:** MED/OS/BT/BC/02/5/A

**UNIT DESCRIPTION**

This unit covers the competencies required to perform numerical functions. The person who is competent in this unit shall be able to: Calculate with whole numbers and familiar fractions, decimals and percentages for work; Estimate, measure, and calculate with routine metric measurements for work; Use routine maps and plans for work; Interpret, draw and construct 2D and 3D shapes for work; Interpret routine tables, graphs and charts for work; Collect data and construct routine tables and graphs for work; and Use basic functions of calculator

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT** These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms*** ***are elaborated in the Range.*** |
| 1. Calculate with whole numbers and familiar fractions, decimals and percentages for work | 1. Mathematical information that may be partly embedded in routine workplace tasks and texts is selected and interpreted
2. Whole numbers and routine or familiar fractions, decimals and percentages including familiar rates are interpreted and comprehended
3. Calculations which may involve a number of steps are perform
4. Calculations done with whole numbers and routine or familiar fractions, decimals and percentages
5. Conversion between equivalent forms of fractions, decimals and percentages is done
6. Order of operations is applied to solve multi-step calculations
7. Problem solving strategies are appropriately applied
8. Estimations are made to check reasonableness of problem solving process, outcome and its appropriateness to the context and task
9. Formal and informal mathematical language and symbolism are used to communicate the result of the task
 |
| 2. Estimate, measure, and calculate with routine metric measurements for work | 1. Measurement information in workplace tasks and texts are selected and interpreted in accordance with workplace requirements
2. Appropriate routine measuring equipment are identified and selected in accordance with workplace requirements
3. Measurements are estimated and made using correct units
4. Estimations and calculations done using routine measurements
5. Conversions performed between routinely used metric units
6. Problem solving processes are used to undertake the tasks
7. Estimations are made to check reasonableness of problem solving process, outcome and its appropriateness to the context and task
8. Information is recorded using mathematical language and symbols appropriate to discuss the task
 |
| 3. Use routine maps and plans for work | 1. Features are identified in routine maps and plans
2. Symbols and keys in routine maps and plans are clearly explained
3. Orientation of map to North is identified and interpreted
4. Understanding of direction and location is clearly demonstrated
5. Simple scale is applied to estimate length of objects, or distance to location or object
6. Directions are given and received using both formal and informal language
 |
| 4. Interpret, draw and construct 2D and 3D shapes for work | 1. Two dimensional shapes and routine three dimensional shapes identified in everyday objects and in different orientations
2. The use and application of shapes elaborately explained
3. Formal and informal mathematical language and symbols used to describe and compare the features of two dimensional shapes and routine three dimensional shapes
4. Common angles identified
5. Common angles in everyday objects are appropriately estimated
6. Formal and informal mathematical language are used to describe and compare common angles
7. Common geometric instruments used to draw two dimensional shapes
8. Routine three dimensional objects constructed from given nets
 |
| 5. Interpret routine tables, graphs and charts for work | 1. Routine tables, graphs and charts identified in predominately familiar texts and contexts
2. common types of graphs and their different uses identified
3. features of tables, graphs and charts identified
4. Information in routine tables, graphs and charts located and interpreted
5. Calculations are perform to interpret information
6. How statistics can inform and persuade interpretations is explained
7. misleading statistical information is identified
8. Information relevant to the workplace is discussed
 |
| 6. Collect data and construct routine tables and graphs for work | 1. Features of common tables and graphs identified
2. uses of **different tables and graphs** identified
3. Data and variables to be collected are determined
4. The audience is determined
5. Method of data collection is select
6. Data is collected
7. Information is collated in a table
8. Suitable scale and axes determined
9. Graph to present information is drafted and drawn
10. Data checked to ensure that it meets the expected results and context
11. Information is reported or discussed using formal and informal mathematical language
 |
| 7. Use basic functions of calculator | 1. Keys are identified and used for **basic functions on a calculator**
2. Calculation done using whole numbers, money and routine decimals and percentages
3. Calculation done with routine fractions and percentages
4. Order of operations is applied to solve multi-step calculations
5. Results are interpreted, displayed and recorded
6. Estimations are made to check reasonableness of problem solving process, outcome and its appropriateness to the context and task
7. Formal and informal mathematical language and appropriate symbolism and conventions used to communicate the result of the task
 |

RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Simple fractions, decimals and percentages
 | May include but not limited to:* 1. Fraction
	2. Decimals
	3. Percentages
 |
| 1. Common 2D shapes and common 3D shapes
 | May include but not limited to:1. Round
2. Square
3. Rectangular
4. Triangle
5. Sphere
6. Cylinder
7. Cube
8. Polygons
9. Cuboids
 |
| 1. Symbols and keys in routine maps and plans
 | May include but not limited to:1. Charts
2. Maps
3. Graphs
 |
| 1. Use basic functions of calculator
 | May include but not limited to:4.1 Addition4.2 Multiplication4.3 Calculate ratios 4.4 Conversion of ratios into percentages |
| 1. Routine tables, graphs and charts for work
 | May include but not limited to:5.1 Bar Graphs5.2 Flow Charts5.3 Pie Charts5.4 Pictograph5.5 Line Graphs5.6 Time Series Graphs5.7 Stem and Leaf Plot5.8 Histogram5.9 Dot Plot5.10 Scatter plot |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Applying Fundamental operations (addition, subtraction, division, multiplication)
* Using calculator
* Using different measuring tools

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Types of common shapes
* Differentiation between two dimensional shapes / objects
* Formulae for calculating area and volume
* Types and purpose of measuring instruments
* Units of measurement and abbreviations
* Fundamental operations (addition, subtraction, division, multiplication)
* Rounding techniques
* Types of fractions
* Different types of tables and graphs
* Meaning of graphs, such as increasing, decreasing, and constant value
* Preparation of basic data, tables & graphs

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:1. Calculated correctly with whole numbers and routine or familiar fractions, decimals and percentages
2. Estimated, measured and calculated with routine metric measurements
3. Applied simple scale to estimate length of objects or distance to location or object
4. Used formal and informal mathematical language to describe and compare common angles
5. Used common geometric instruments to draw two dimensional shapes
6. Collected data and constructed routine tables and graphs
7. Used basic functions of calculator correctly
 |
| 2. Resource Implications | 2.1 Calculator2.2 Basic measuring instruments |
| 3. Methods of Assessment | Competency may be assessed through:3.1 Written Test3.2 Interview/Oral Questioning* 1. Demonstration
 |
| 4. Context of Assessment | Competency may be assessed in an off the job setting  |
| 5. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE DIGITAL LITERACY

**UNIT CODE:** MED/OS/BT/BC/03/5/A

**UNIT DESCRIPTION**

This unit covers the competencies required to effectively use digital devices such as smartphones, tablets, laptops and desktop PCs. It entails identifying and using digital devices such as smartphones, tablets, laptops and desktop computers for purposes of communication, work performance and management at the workplace.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Identify appropriate computer software and hardware
 | * 1. Concepts of ICT are determined in accordance with computer equipment
	2. Classifications of computers are determined in accordance with manufacturers specification
	3. ***Appropriate computer software*** is identified according to manufacturer’s specification
	4. ***Appropriate computer hardware*** is identified according to manufacturer’s specification
	5. Functions and commands ofoperating system are determined in accordance withmanufacturer’s specification
 |
| 1. Apply security measures to data, hardware, software in automated environment
 | * 1. ***Data security and privacy are classified*** in accordance with the prevailing technology
	2. ***Security threats*** areidentified, **and *control measures*** are applied in accordance with laws governing protection of ICT
	3. Computer threats and crimes are detected.
	4. Protection against computer crimes is undertaken in accordance with laws governing protection of ICT
 |
| 1. Apply computer software in solving tasks
 | * 1. ***Word processing concepts***are applied in resolving workplace tasks, report writing and documentation
	2. ***Word processing utilities*** are applied in accordance with workplace procedures
	3. Worksheet layout is prepared in accordance with work procedures
	4. Worksheet is build and data manipulated in the worksheet in accordance with workplace procedures
	5. Continuous data manipulated on worksheet is undertaken in accordance with work requirements
	6. Database design and manipulation is undertaken in accordance with office procedures
	7. Data sorting, indexing, storage, retrieval and security is provided in accordance with workplace procedures
 |
| 1. Apply internet and email in communication at workplace
 | * 1. Electronic mail addresses are opened and applied in workplace communication in accordance with office policy
	2. Office internet functions are defined and executed in accordance with office procedures
	3. ***Network configuration*** is determined in accordance with office operations procedures
	4. Official World Wide Web is installed and managed according to workplace procedures
 |
| 1. Apply desktop publishing in official assignments
 | * 1. Desktop publishing functions and tools are identified in accordance with manufactures specifications
	2. Desktop publishing tools are developed in accordance with work requirements
	3. Desktop publishing tools are applied in accordance with workplace requirements
	4. Typeset work is enhanced in accordance with workplace standards
 |
| 1. Prepare presentation packages
 | * 1. Types of presentation packages are identified in accordance with office requirements
	2. Slides are created and formulated in accordance with workplace procedures
	3. Slides are edited and run in accordance with work procedures
	4. Slides and handouts are printed according to work requirements
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| ***Appropriate computer software*** may include but not limited to: | A collection of instructions or computer tools that enable the user to interact with a computer, its hardware, or perform tasks.  |
| ***Appropriate computer hardware*** may include but not limited to: | Collection of physical parts of a computer system such as;* Computer case, monitor, keyboard, and mouse
* All the parts inside the computer case, such as the hard disk drive, motherboard and video card
 |
| ***Data security and privacy*** may include but not limited to: | * Confidentiality of data
* Cloud computing
* Integrity -but-curious data surfing
 |
| ***Security and control measures*** may include but not limited to: | * Counter measures against cyber terrorism
* Risk reduction
* Cyber threat issues
* Risk management
* Pass wording
 |
| ***Security threats*** may include but not limited to: | * Cyber terrorism
* Hacking
 |
| ***Word processing concepts*** may include but not limited to: | Using a special program to create, edit and print documents |
| ***Network configuration*** may include but not limited to: | Organizing and maintaining information on the components of a computer network |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Analytical skills
* Interpretation
* Typing
* Communication
* Computing (applying fundamental operations such as addition, subtraction, division and multiplication)
* Using calculator
* Basic ICT skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Software concept
* Functions of computer software and hardware
* Data security and privacy
* Computer security threats and control measures
* Technology underlying cyber-attacks and networks
* Cyber terrorism
* Computer crimes
* Detection and protection of computer crimes
* Laws governing protection of ICT
* Word processing;
* Functions and concepts of word processing.
* Documents and tables creation and manipulations
* Mail merging
* Word processing utilities
* Spread sheets;
* Meaning, formulae, function and charts, uses and layout
* Data formulation, manipulation and application to cells
* Database;
* Database design, data manipulation, sorting, indexing, storage retrieval and security
* Desktop publishing;
* Designing and developing desktop publishing tools
* Manipulation of desktop publishing tools
* Enhancement of typeset work and printing documents
* Presentation Packages;
* Types of presentation Packages
* Creating, formulating, running, editing, printing and presenting slides and handouts
* Networking and Internet;
* Computer networking and internet.
* Electronic mail and world wide web
* Emerging trends and issues in ICT;
* Identify and integrate emerging trends and issues in ICT
* Challenges posed by emerging trends and issues

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Identified and controlled security threats
	2. Detected and protected computer crimes
	3. Applied word processing in office tasks
	4. Designed, prepared work sheet and applied data to the cells in accordance to workplace procedures
	5. Opened electronic mail for office communication as per workplace procedure
	6. Installed internet and World Wide Web for office tasks in accordance with office procedures
	7. Integrated emerging issues in computer ICT applications
	8. Applied laws governing protection of ICT
 |
| 1. Resource Implications
 | * 1. Tablets
	2. Laptops
	3. Desktop computers
	4. Calculators
	5. Internet
	6. Smart phones
	7. Operation Manuals
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Written Test
	2. Demonstration
	3. Practical assignment
	4. Interview/Oral Questioning
	5. Demonstration
 |
| 1. Context of Assessment
 | Competency may be assessed in an off and on the job setting |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE ENTREPRENEURIAL SKILLS

**UNIT CODE :** MED/OS/BT/BC/04/5/A

**UNIT DESCRIPTION**

This unit covers the outcomes required to build and develop the enterprise to be more competitive within a changing business environment, specifically responding to consumer demands while maintaining product quality and accessibility, building a customer base and employee motivation.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT** | **PERFORMANCE CRITERIA**  |
| 1. Develop business Innovative strategies
 | 1. Business innovation strategies are determined in accordance with the organization strategies
2. Business innovative strategies are implemented for the purpose of business growth
3. Track record and normative capability profile of enterprise and similar businesses are reviewed and considered in setting ***strategic directions***.
4. Strengths, weaknesses, opportunities and threats are considered when developing new ideas, approaches, goals and directions
5. Decisions about enterprise strategies/directions are made after careful consideration of all relevant information
6. ***Business/corporate plan*** is developed that sets out tactics, resource implications, timeframes, production and sales target
 |
| 1. Develop new products/ markets
 | 2.1 Alternative product/service offerings are canvassed and studied for feasibility2.2 Potential and new sources/sellers of supplies and raw materials are identified and canvassed.2.3 Target markets and buyers are identified and surveyed as to their preferences and brand loyalties. |
| 1. Expand customers and product lines
 | 3.1 Enterprise is built up and sustained through responsiveness to market demands and the regulatory environment. 3.2 Competitive advantage of existing products and services is maintained/enhanced through responsive advocacies and strategies. 3.3 Constant listening to stakeholder/client feedback is ensured to maintain loyal client base.  |
| 1. Motivate staff/workers
 | 4.1 Regular dialogue is established and maintained in all levels and relevant sections of the enterprise4.2 Flow of communications in both directions is encouraged4.3 Helpful mechanisms and benefits are implemented4.4 Issues/problems are proactively resolved through win-win solutions wherever practicable |
| 1. Expand employed capital base
 | 5.1 Capital employed in business is continuously reviewed as per the strategic plan5.2 Business share holdings are reviewed in accordance with the type of business 5.3 Capital employed is expanded according to organization procedures5.3 Types of shares are determined according to strategic plan5.4 Shares diversification process is undertaken as per office procedures5.5 Role of shareholders is determined and implemented in accordance organization procedures  |
| 1. Undertake county/ regional business expansion
 | 6.1 Regions for expansion are continuously reviewed in accordance with strategic plan and company’s expansion plan6.2 County business regulations are reviewed and adhered to in accordance with set procedures6.3 Regional laws and regulations are adhered to in accordance with set procedures6.4 County/regional business expansion is undertaken in accordance with organization’s growth/ expansion plan |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
| 1. Strategic directions include but not limited to: | 1.1 Business continuity and succession1.2 Resource access security1.3 Core competencies development1.4 New developments e.g. technological change, new products |
| 2. Business/Corporate plan include but not limited to: | 2.1 Action steps and responsibilities of departments and individual workers 2.2 Resource requirements and budget 2.3 Tactics and strategies to achieve objectives  |
| 3. Helpful mechanisms include but not limited to: | 3.1 Wage and non-wage benefits 3.2 Employee awards and recognition systems 3.3 Employee rights and welfare policies 3.4 Full-disclosure/transparency policies  |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Assessing a range of alternative products and strategies
* Critically analyzing information, summarizing and making sense of previous and current market trends
* Identifying changing consumer preferences and demographics
* Thinking “outside the box”
* Ensuring quality consistency
* Reducing lead time to product/service delivery
* Managing operations/ production
* Using formal problem-solving procedures, e. g., root-cause analysis, six sigmas
* Communication skills
* Applying motivational principles, e. g., positive stroking, behavior modification
* Assessing range of alternatives rather than choosing the easiest option
* Achieving ownership and credibility for the enterprise vision
* Critically analyzing information, summarizing and making sense of previous and current market trends
* Developing solutions and practical strategies which are “outside the box”

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Features and benefits of common operational practices, e. g., continuous improvement (kaizen), waste elimination,
* Conflict resolution
* Health, safety and environment (HSE) principles and requirements
* Public-relations strategies
* Basic cost-benefit analysis
* Basic financial management
* Business strategic planning
* Impact of change on individuals, groups and industries
* Employee assistance
* Government and regulatory processes
* Local and international market trends
* Product promotion strategies
* Mechanisms in the enterprise
* Market and feasibility studies
* Local and global supply chains Business models and strategies
* Government and regulatory processes
* Local and international business environment
* Concepts of change management
* Relevant developments in other industries
* Capital employed
* Regional/ County business expansion
* Innovation in business

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:1.1 Demonstrated ability to maintain a profitable and stable enterprise as shown by stakeholder feedback, employee testimonies and company financial statements1.2 Demonstrated ability to conceptualize and plan a micro/small enterprise1.3 Demonstrated ability to manage/operate a micro/small-scale business1.4 Demonstrated basic marketing skills |
| 2. Resource Implications | The following resources should be provided:2.1 Interview guide for entrepreneurs2.2 Enterprise workers and third parties 2.3 Materials and location relevant to the proposed activity and tasks  |
| 3. Methods of Assessment | 3.1 Case problems3.2 Interview3.3 Portfolio3.4 Third part reports |
| 4. Context of Assessment | 4.1 Competency may be assessed in workplace or in a simulated workplace setting 4.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group  |
| 5. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE EMPLOYABILITY SKILLS

**UNIT CODE:** MED/OS/BT/BC/05/5/A

**UNIT DESCRIPTON**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading small teams, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and workplace ethics.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Conduct self-management
 | 1. Personal vision, mission and goals are formulated based on potential and in relation to organization objectives
2. Emotions are managed as per workplace requirements
3. Individual performance is evaluated and monitored according to the agreed targets.
4. Assertiveness is developed and maintained based on the requirements of the job.
5. Accountability and responsibility for own actions are demonstrated.
6. Self-esteem and a positive self-image are developed and maintained.
7. Time management, attendance and punctuality are observed as per the organization policy.
8. Goals are managed as per the organization’s objective
9. Self-strengths and weaknesses are identified as per ***personal objectives***
10. Critics are managed as per personal objectives
 |
| 1. Demonstrate interpersonal communication
 | 1. Listening and understanding is demonstrated as per communication policy
2. Writing to the needs of the audience is demonstrated as per communication policy
3. Speaking, reading and writing is demonstrated as per communication policy
4. Empathizing is demonstrated as per the communication policy
5. Internal and external customers’ needs are identified and interpreted as per the communication policy
6. Persuasion is demonstrated as per the communication policy
7. Communication networks are established as per the SOPs
8. Information is shared as per communication structure
 |
| 1. Demonstrate critical safe work habits
 | * 1. Stress is managed in accordance with workplace procedures.
	2. Punctuality and time consciousness are demonstrated in line with workplace policy.
	3. Personal objectives are integrated with organization goals based on organization’s strategic plan.
	4. Work priorities are set in accordance to workplace procedures.
	5. Leisure time is recognized in line with organization policy.
	6. Abstinence from ***drug and substance abuse*** is observed as per workplace policy.
	7. Awareness of HIV and AIDS is demonstrated in line with workplace requirements.
	8. Safety consciousness is demonstrated in the workplace based on organization safety policy.
	9. ***Emerging issues*** are dealt with in accordance with organization policy.
 |
| 1. Lead small teams
 | 1. Performance expectations for the ***team*** are set as per the organization objectives
2. Tasks are assigned in accordance with the organization policy.
3. Team performance indicators are identified according to set rules and regulations.
4. ***Forms of communication*** in a team are established according to office policy.
5. Communication is carried out as per workplace place policy and requirements of the job.
6. ***Feedback*** on performance is collected and analyzed based on established team learning process
7. ***Gender mainstreaming*** is undertaken in accordance with set regulations.
 |
| 1. Plan and organize work
 | 1. Task requirements are identified as per the workplace objectives
2. Task is interpreted in accordance with safety (OHS ), environmental requirements and quality requirements
3. Work activity is organized with other involved personnel as per the SOPs
4. Resources are mobilized, allocated and utilized to meet project goals and deliverables.
5. Work activities are monitored and evaluated in line with organization procedures.
6. Job planning is documented in accordance with workplace requirements.
7. Time is managed achieve workplace set goals and objectives.
 |
| 1. Maintain professional growth and development
 | * 1. Personal training needs are identified and assessed in line with the requirements of the job.
	2. ***Training and career opportunities*** are identified and availed based on job requirements.
	3. Licensees and certifications relevant to job and career are obtained and renewed.
	4. ***Personal growth*** is pursued towards improving the qualifications set for the profession.
	5. Work priorities are identified based on requirement of the job and workplace policy.
	6. Recognitions are sought as proof of career advancement in line with professional requirements.
 |
| 1. Demonstrate workplace learning
 | * 1. Own learning is managed as per workplace policy.
	2. Learning opportunities are sought and allocated based on job requirement and in line with organization policy.
	3. Contribution to the learning community at the workplace is carried out.
	4. ***Range of media for learning*** are identified as per the training need
	5. Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job
	6. Enthusiasm for ongoing learning is demonstrated
	7. Time and effort is invested in learning new skills-based job requirements
	8. Willingness to learn in different context is demonstrated based on available learning opportunities arising in the workplace.
	9. Opportunities for performance improvement are identified proactively in area of work.
	10. Awareness of personal role in workplace ***innovation*** is demonstrated.
 |
| 1. Demonstrate problem solving skills
 | * 1. Problems are identified as per the context of data and circumstances
	2. Problem solutions are sought based on the problem
	3. Independence and initiative in identifying and solving problems is demonstrated.
	4. Team problems are solved as per the workplace guidelines
	5. Problem solving strategies are applied as per the workplace guidelines
 |
| 1. Demonstrate workplace ethics
 | * 1. Policies and guidelines are observed as per the workplace requirements
	2. Self-worth and profession is exercised in line with personal goals and organizational policies
	3. Code of conduct is observed as per the workplace requirements
	4. Personal and professional integrity is demonstrated as per the personal goals
	5. Commitment to jurisdictional laws is demonstrated as per the workplace requirements
 |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Range** | **Variable** |
| ***Drug and substance abuse*** include but not limited to: | Commonly abused* Alcohol
* Tobacco
* Miraa
* Over-the-counter drugs
* Cocaine
* Bhang
* Glue
 |
| ***Feedback*** includes but not limited to: | * Verbal
* Written
* Informal
* Formal
 |
| ***Relationships*** includes but not limited to: | * Man/Woman
* Trainer/trainee
* Employee/employer
* Client/service provider
* Husband/wife
* Boy/girl
* Parent/child
* Sibling relationships
 |
| ***Forms of communication*** include but not limited to: | * Written
* Visual
* Verbal
* Non verbal
* Formal and informal
 |
| ***Team*** includes but not limited to: | * Small work group
* Staff in a section/department
* Inter-agency group
 |
| ***Personal growth*** includes but not limited to: |

|  |
| --- |
| * Growth in the job
* Career mobility
* Gains and exposure the job gives
* Net workings
* Benefits that accrue to the individual as a result of noteworthy performance
 |

 |
| ***Personal objectives*** include but not limited to: | * Long term
* Short term
* Broad
* Specific
 |
| ***Trainings and career opportunities*** includes but not limited to | * Participation in training programs
* Technical
* Supervisory
* Managerial
* Continuing Education
* Serving as Resource Persons in conferences and workshops
 |
| ***Resource*** include but not limited to: | * Human
* Financial
* Technology
* Hardware
* Software
 |
| ***Innovation*** include but not limited to: | * New ideas
* Original ideas
* Different ideas
* Methods/procedures
* Processes
* New tools
 |
| ***Emerging issues*** include but not limited to: | * Terrorism
* Social media
* National cohesion
* Open offices
 |
| ***Range of media for learning*** include but not limited to:  | * Mentoring
* peer support and networking
* IT and courses
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Personal hygiene practices
* Intra and Interpersonal skills
* Communication skills
* Knowledge management
* Interpersonal skills
* Critical thinking skills
* Observation skills
* Organizing skills
* Negotiation skills
* Monitoring skills
* Evaluation skills
* Record keeping skills
* Problem solving skills
* Decision Making skills
* Resource utilization skills
* Resource mobilization skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Work values and ethics
* Company policies
* Company operations, procedures and standards
* Occupational Health and safety procedures
* Fundamental rights at work
* Personal hygiene practices
* Workplace communication
* Concept of time
* Time management
* Decision making
* Types of resources
* Work planning
* Resources and allocating resources
* Organizing work
* Monitoring and evaluation
* Record keeping
* Workplace problems and how to deal with them
* Negotiation
* Assertiveness
* Teamwork
* Gender mainstreaming
* HIV and AIDS
* Drug and substance abuse
* Leadership
* Safe work habits
* Professional growth and development
* Technology in the workplace
* Learning
* Creativity
* Innovation
* Emerging issues
	+ Social media
	+ Terrorism
	+ National cohesion

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Conducted self-management
	2. Demonstrated interpersonal communication
	3. Demonstrated critical safe work habits
	4. Led small teams
	5. Planned and organized work
	6. Maintained professional growth and development
	7. Demonstrated workplace learning
	8. Demonstrated problem solving skills
	9. Demonstrated workplace ethics
 |
| 1. Resource Implications
 |

|  |
| --- |
| The following resources should be provided:  |

* 1. Case studies/scenarios
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: * Oral Interview
* Observation
* Third Party Reports
* Written
 |
| 1. Context of Assessment
 | * 1. Competency may be assessed in workplace or in a simulated workplace setting
	2. Assessment shall be observed while tasks are being undertaken whether individually or in-group
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

#

# DEMONSTRATE ENVIRONMENTAL LITERACY

**UNIT CODE:** MED/OS/BT/BC/06/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to follow procedures for environmental hazard control, follow procedures for environmental pollution control, comply with workplace sustainable resource use, evaluate current practices in relation to resource usage, develop and adhere to environmental protection principles/strategies/guidelines.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Control environmental hazard
 | * 1. ***Storage methods*** for environmentally***hazardous*** materials are strictly followed according to environmental regulations and OSHS.
	2. ***Disposal methods*** of hazardous wastes are followed always according to environmental regulations and OSHS.
	3. ***PPE*** is used according to OSHS.
 |
| 1. Control environmental Pollution control
 | * 1. Environmental pollution ***control measures*** are compiled following standard protocol.
	2. Procedures for solid waste management are observed according to Environmental Management and Coordination Act 1999
	3. Methods for minimizing ***noise pollution*** complied following environmental regulations.
 |
| 1. Demonstrate sustainable resource use
 | * 1. Methods for minimizing wastage are complied with.
	2. Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle)
	3. Methods for economizing or reducing resource consumption are practiced.
 |
| 1. Evaluate current practices in relation to resource usage
 | * 1. Information on resource efficiency **systems and procedures** are collected and provided to the work group where appropriate.
	2. Current resource usage is measured and recorded by members of the work group.
	3. Current purchasing strategies are analyzed and recorded according to industry procedures.
	4. Current work processes to access information and data is analyzed following enterprise protocol.
 |
| 1. Identify Environmental legislations/conventions for environmental concerns
 | * 1. Environmental ***legislations/conventions*** and local ordinances are identified according to the different ***environmental aspects/impact***
	2. ***Industrial standard/environmental practices*** are described according to the different environmental concerns
 |
| 1. Implement specific environmental programs
 | * 1. Programs/Activities are identified according to organizations policies and guidelines.
	2. Individual roles/responsibilities are determined and performed based on the activities identified.
	3. Problems/constraints encountered are resolved in accordance with organizations’ policies and guidelines
	4. Stakeholders are consulted based on company guidelines
 |
| 1. Monitor activities on Environmental protection/Programs
 | * 1. Activities are periodically monitored and evaluated according to the objectives of the environmental Program
	2. Feedback from stakeholders are gathered and considered in proposing enhancements to the program based on consultations
	3. Data gathered are analyzed based on evaluation requirements
	4. Recommendations are submitted based on the findings
	5. Management support systems are set/established to sustain and enhance the program
	6. Environmental incidents are monitored and reported to concerned/proper authorities
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. ***PPE*** may include but are not limited to:
 | 1.1 Mask1.2 Gloves1.3 Goggles1.4 Safety hat1.5 Overall* 1. Hearing protector
	2. Safety boots
 |
| 1. ***Environmental pollution control measures*** may include but are not limited to:
 | * 1. Methods for minimizing or stopping spread and ingestion of airborne particles
	2. Methods for minimizing or stopping spread and ingestion of gases and fumes
	3. Methods for minimizing or stopping spread and ingestion of liquid wastes
 |
| 1. ***Waste management procedures*** may include but are not limited to:
 | 3.1 Sorting3.2 Storing of items3.2 Recycling of items3.3 Disposal of items |
| 1. ***Resources*** may include but are not limited to:
 | 4.1 Electric4.2 Water4.3 Fuel4.3 Telecommunications* 1. Supplies

4.5 Materials |
| 1. ***Workplace environmental hazards*** may include but are not limited to:
 | 5.1Biological hazards5.2 Chemical and dust hazards5.3 Physical hazards |
| 1. ***Organizational systems and procedures*** may include but are not limited to:
 | 6.1 Supply chain, procurement and purchasing6.2 Quality assurance6.3 Making recommendations and seeking approvals |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Following storage methods of environmentally hazardous materials
* Following disposal methods of hazardous wastes
* Using PPE
* Practicing OSHS
* Complying environmental pollution control
* Observing solid waste management
* Complying methods of minimizing noise Pollution
* Complying methods of minimizing wastage
* Employing waste management procedures
* Economizing resource consumption
* Listing of resources used
* Measuring current usage of resources
* Identifying and reporting workplace environmental hazards
* Conveying all environmental issues
* Following environmental regulations
* Identifying environmental regulations
* Assessing procedures for assessing compliance
* Collecting information on environmental and resource efficiency systems and procedures, and Providing information to the work group
* Measuring and recording current resource usage
* Analysing and recording current purchasing strategies.
* Analysing current work processes to access information and data and Assisting identifying areas for improvement
* Analysing resource flow
* Determining efficiency of use/conversion of resources
* Determining causes of low efficiency of use
* Developing plans for increasing the efficiency of resource use
* Checking resource use plans
* Complying to regulations/licensing requirements
* Determining benefit/cost of plans
* Ranking proposals based on benefit/cost compared to limited resources
* Checking proposals meet regulatory requirements
* Monitoring implementation
* Adjusting plan and implementation
* checking new resource usage

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Storage methods of environmentally hazardous materials
* Disposal methods of hazardous wastes
* Usage of PPE Environmental regulations
* OSHS
* Types of pollution
* Environmental pollution control measures
* Different solid wastes
* Solid waste management
* Different noise pollution
* Methods of minimizing noise pollution
* Solid Waste Act
* Methods of minimizing wastage
* Waste management procedures
* Economizing of resource consumption
* 3Rs principle
* Types of resources
* Techniques in measuring current usage of resources
* Calculating current usage of resources
* Types of workplace environmental hazards
* Environmental regulations
* Environmental regulations applying to the enterprise.
* Procedures for assessing compliance with environmental regulations.
* Collection of information on environmental and resource efficiency systems and procedures,
* Measurement and recording of current resource usage
* Analysis and recording of current purchasing strategies.
* Analysis current work processes to access information and data Analysis of data and information
* Identification of areas for improvement
* Resource consuming processes
* Determination of quantity and nature of resource consumed
* Analysis of resource flow of different parts of the resource flow process
* Use/conversion of resources
* Causes of low efficiency of use
* Increasing the efficiency of resource use
* Inspection of resource use plans
* Regulations/licensing requirements
* Determine benefit/cost for alternative resource sources
* Benefit/costs for different alternatives
* Components of proposals
* Criteria on ranking proposals
* Regulatory requirements
* Proposals for improving resource efficiency
* Implementation of resource efficiency plans
* Procedures in monitor implementation
* Adjustments of implementation plan
* Inspection of new resource usage

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Controlled environmental hazard
	2. Controlled environmental pollution
	3. Demonstrated sustainable resource use
	4. Evaluated current practices in relation to resource usage
	5. Demonstrated knowledge of environmental legislations and local ordinances according to the different environmental issues /concerns.
	6. Described industrial standard environmental practices according to the different environmental issues/concerns.
	7. Resolved problems/ constraints encountered based on management standard procedures
	8. Implemented and monitored environmental practices on a periodic basis as per company guidelines
	9. Recommended solutions for the improvement of the Program
	10. Monitored and reported to proper authorities any environmental incidents
 |
| 1. Resource Implications
 | The following resources should be provided:* 1. Workplace with storage facilities
	2. Tools, materials and equipment relevant to the tasks (ex. Cleaning tools, cleaning materials, trash bags, etc.)
	3. PPE
	4. Manuals and references
	5. Legislation, policies, procedures, protocols and local ordinances relating to environmental protection
	6. Case studies/scenarios relating to environmental Protection
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through:* 1. Demonstration
	2. Oral questioning
	3. Written examination
	4. Interview/Third Party Reports
	5. Portfolio (citations/awards from GOs and NGOs, certificate of training – local and abroad)
	6. Simulations and role-plays
 |
| 1. Context of Assessment
 | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment.  |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** MED/OS/BT/BC/07/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to lead the implementation of workplace’s safety and health program, procedures and policies/guidelines.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Identify workplace hazards and risk
 | 1.1 ***Hazards*** in the workplace and/or its ***indicators*** of its presence, are identified1.2 ***Evaluation and/or work environment*** measurements of OSH hazards/risk existing in the workplace is conducted by  Authorized personnel or agency1.3 ***OSH issues and/or concerns*** raised by workers are  Gathered |
| 1. Identify and implement appropriate control measures
 | 2.1 Prevention ***and control measures***, including use of  s***afety gears / PPE (personal protective equipment)*** for specific hazards  identified and implemented2.2 Appropriate ***risk controls*** based on result of OSH hazard evaluation is recommended.2.3 ***Contingency measures***, including ***emergency procedures*** during workplace ***incidents and emergencies*** are recognized and established in accordance with organization procedures. |
| 1. Implement OSH programs, procedures and policies/ guidelines
 | 3.1 Information to work team about company OSH program, procedures and policies/guidelines are provided3.2 Implementation of OSH procedures and policies/ guidelines are participated3.3 Team members are trained and advised on OSH standards and procedures3.4 Procedures for maintaining ***OSH-related records*** are implemented |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. ***Hazards may include*** but are not limited to:
 | 1.1. Physical hazards – impact, illumination, pressure, noise, vibration, extreme temperature, radiation1.2 Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects1.3 Chemical hazards – dusts, fibers, mists, fumes, smoke, gasses, vapors1.4 Ergonomics Psychological factors – over exertion/ excessive force, awkward/static positions, fatigue, direct pressure, varying metabolic cycles Physiological factors – monotony, personal relationship, work out cycle1.6 Safety hazards (unsafe workplace condition) – confined space, excavations, falling objects, gas leaks, electrical, poor storage of materials and waste, spillage, waste and debris1.7 Unsafe workers’ act (Smoking in off-limited areas, Substance and alcohol abuse at work) |
| 1. ***Indicators may include*** but are not limited to:
 | 2.1 Increased of incidents of accidents, injuries2.2 Increased occurrence of sickness or health complaints/ symptoms2.3 Common complaints of workers related to OSH2.4 High absenteeism for work-related reasons |
| 1. ***Evaluation and/or work environment measurements*** may include but are not limited to:
 | 3.1 Health Audit3.2 Safety Audit3.3 Work Safety and Health Evaluation3.4 Work Environment Measurements of Physical and Chemical Hazards |
| 1. ***OSH issues and/or concerns*** may include but are not limited to:
 | 4.1 Workers’ experience/observance on presence of work hazards4.2 Unsafe/unhealthy administrative arrangements (prolonged work hours, no break time, constant overtime, scheduling of tasks)4.3 Reasons for compliance/non-compliance to use of PPEs or other OSH procedures/policies/guidelines |
| 1. ***Prevention and control measures*** may include but are not limited to:
 | 5.1 Eliminate the hazard (i.e., get rid of the dangerous machine5.2 Isolate the hazard (i.e. keep the machine in a closed room and operate it remotely; barricade an unsafe area off) 5.3 Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one)5.4 Use administrative controls to reduce the risk (i.e. give trainings on how to use equipment safely; OSH-related topics, issue warning signages, rotation/shifting work schedule)5.5 Use engineering controls to reduce the risk (i.e. use safety guards to machine)5.6 Use personal protective equipment5.7 Safety, Health and Work Environment Evaluation5.8 Periodic and/or special medical examinations of workers |
| 1. ***Safety gears /PPE (Personal Protective Equipment’s)*** may include but are not limited to:
 | 6.1 Arm/Hand guard, gloves6.2 Eye protection (goggles, shield)6.3 Hearing protection (ear muffs, ear plugs)6.4 Hair Net/cap/bonnet6.5 Hard hat6.6 Face protection (mask, shield)6.7 Apron/Gown/coverall/jump suit6.8 Anti-static suits* 1. High-visibility reflective vest
 |
| 1. ***Appropriate risk controls***
 | Appropriate risk controls in order of impact are as follows:7.1 Eliminate the hazard altogether (i.e., get rid of the dangerous machine)7.2 Isolate the hazard from anyone who could be harmed (i.e., keep the machine in a closed room and operate it remotely; barricade an unsafe area off)7.3 Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one)7.4 Use administrative controls to reduce the risk (i.e., train workers how to use equipment safely; train workers about the risks of harassment; issue signage)7.5 Use engineering controls to reduce the risk (i.e., attach guards to the machine to protect users)7.6 Use personal protective equipment (i.e., wear gloves and goggles when using the machine) |
| 1. ***Contingency measures*** may include but are not limited to:
 | 8.1 Evacuation8.2 Isolation8.3 Decontamination8.4 (Calling designed) emergency personnel |
| 1. ***Emergency procedures*** may include but are not limited to:
 | 9.1 Fire drill9.2 Earthquake drill9.3 Basic life support/CPR9.4 First aid9.5 Spillage control9.6 Decontamination of chemical and toxic9.7 Disaster preparedness/management9.8 se of fire-extinguisher |
| 1. ***Incidents and emergencies*** may include but are not limited to:
 | 10.1 Chemical spills10.2 Equipment/vehicle accidents10.3 Explosion10.4 Fire10.5 Gas leak10.6 Injury to personnel10.7 Structural collapse10.8 Toxic and/or flammable vapors emission. |
| 1. ***OSH-related Records*** may include but are not limited to:
 | 11.1 Medical/Health records11.2 Incident/accident reports11.3 Sickness notifications/sick leave application11.4 OSH-related trainings obtained |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Skills on preliminary identification of workplace hazards/risks
* Knowledge management
* Critical thinking skills
* Observation skills
* Coordinating skills
* Communication skills
* Interpersonal skills
* Troubleshooting skills
* Presentation skills
* Training skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* General OSH Principles
* Occupational hazards/risks recognition
* OSH organizations providing services on OSH evaluation and/or work environment measurements (WEM)
* National OSH regulations; company OSH policies and protocols
* Systematic gathering of OSH issues and concerns
* General OSH principles
* National OSH regulations
* Company OSH and recording protocols, procedures and policies/guidelines
* Training and/or counseling methodologies and strategies

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1. Identifies hazards/risks in the workplace and/or its indicators
2. Requests for evaluation and/or work environment measurements of OSH hazards/risk in the workplace
3. Gathers OSH issues and/or concerns raised by workers
4. Identifies and implements prevention and control measures, including use of PPE (personal protective equipment) for specific hazards
5. Recommends appropriate risk controls based on result of OSH hazard evaluation and OSH issues gathered
6. Establish contingency measures, including emergency procedures in accordance with organization procedures
7. Provides information to work team about company OSH program, procedures and policies/guidelines
8. Participates in the implementation of OSH procedures and policies/guidelines
9. Trains and advises team members on OSH standards and procedures
10. Implements procedures for maintaining OSH-related records
 |
| 1. Resource Implications
 | The following resources should be provided:2.1 Workplace or assessment location2.2 OSH personal records2.3 PPE2.4 Health records |
| 1. Methods of Assessment
 | Competency may be assessed through:3.1 Portfolio Assessment3.2 Interview3.3 Case Study/Situation3.4 Observation/Demonstration and oral questioning |
| 1. Context of Assessment
 | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment.  |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# COMMON UNITS OF COMPETENCY

# DEMONSTRATE UNDERSTANDING OF BASIC BIOMETRICS

**UNIT CODE:** MED/OS/BT/CC/01/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate understanding of basics biometrics. It includes: Understanding basic statistics, statistical models, biometric data and how to infer biostatistics data.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**These are **assessable** statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the range.*** |
| 1. Understand basic statistics
 | * 1. Qualitative and quantitative variables are differentiated as per the type of data
	2. Range of measurement is determined as per the data sample
	3. Mean of measurement are calculated as per the data set
	4. Median of data set sampled is calculated as per the data set
	5. Mode is identified as per the data set sampled
	6. Standard deviation is calculated as per the data set sampled
	7. Variance is calculated as per the data set sample
	8. Hypothesis is tested according to research objective
 |
| 1. Understand basic statistical models
 | * 1. T-test/F-test is calculated as per the data set sampled
	2. Complete randomized design model of the experimental are determined as per experimental unit
	3. Randomized complete block design model of the experimental are determined as per ***experimental units***
	4. Parametric and non-parametric models of the experiment are determined as per experimental units identified
 |
| 1. Understand basic biometric data
 | * 1. Probability is tested as per the objectives of the experiment
	2. The relationships between the dependent and independent variables of the experimental units are determined as per data set sampled
	3. Linear correlation effects are determined as per the data set of the experimental units
	4. Linear regression analyses of the data set sampled are determined as per the experimental units
 |
| 1. Understand how to infer biostatistics data.
 | * 1. Confidence intervals of the experimental data are determined as per the data set collected
	2. ***Hypotheses*** tested are inferred as per the experimental objectives
	3. Coefficient of variation (CV) are inferred as per the experimental objectives
	4. Conclusions are drawn as per experimental objectives
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
| 1. Experimental units may include but not limited to
 | * Genotypes
* Treatments
* Environments
* Animals
 |
| 1. Hypotheses may include but not limited to
 | * Null hypothesis
* alternate hypothesis
 |
|  |  |
|  |  |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

**SKILLS**

The individual needs to demonstrate the following skills:

* Communication
* Data analysis
* Data organization
* Experimental design
* Hypothesis testing
* Data interpretation
* Decision making
* Management
* Leadership

**REQUIRED KNOWLEDGE**

The individual needs to demonstrate knowledge in:

* Basic mathematics
* Biostatistics
* Experimental designs and layout
* Research methods
* Sampling methods
* ICT

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:Demonstrates;1. Understanding of computing sample mean median range, mode standard deviation
2. Computation of population mean and sample standard deviation
3. Understanding of null hypothesis and alternate hypothesis
4. Demonstrates understanding of testing procedures of hypothesis
5. Demonstrate ability to use tables, graphs, bar-charts, pie charts to summarize data and data results
 |
| 1. Resource Implications for competence certification
 | The following resources must be provided:* 1. Access to relevant workplace where assessment can take place
	2. Appropriately simulated environment where assessment can take place
	3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be accessed through:* 1. Written tests
	2. Practicals
	3. Oral questioning
	4. Third party reports
	5. Case studies
 |
| 1. Context of Assessment
 | Competency may be assessed:1. On the job
2. Off the job
3. In work placement (attachment)

Off the job assessment must be undertaken in a closely simulated workplace environment |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry subsector, workplace and job roles is recommended.  |

# DEMONSTRATE BASIC KNOWLEDGE OF CELL BIOLOGY & HISTOLOGY

**UNIT CODE:** MED/OS/BT/CC/02/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate basic knowledge of cell biology and histology. It involves identifying cell structure and function, demonstrating knowledge of cell and cell division, Identification of histological and cytological study methods, demonstrating knowledge of types of tissues and their function, cell totipotency and basic DNA and gene function.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**These are **assessable** statements which specify the required level of performance for each of the elements.***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Identify cell structure and function
 | 1. Importance of cell structures and physiological terminologyare outlined
2. Importance of cell and physiological terminology applied to daily tasks as per the cell types
 |
| 1. Demonstrate the knowledge of cell and cell division
 | 1. ***Cell types*** are identified as per the cell origin
2. Components of a cell identified as per the cell type
3. Processes of ***cell division*** outlined as per ***tissue type***
4. The composition of cytoplasm described as per the cell type
 |
| 1. Identify histological and cytological study methods
 | 1. Direct observation performed based on workplace procedures
2. Histochemical, chemical and physical methods identified based on the material available
3. ***Staining methods*** identified as per cell type
4. Immunohistochemical methods identified based on the material available
5. X-ray diffraction performed as per the workplace procedures
 |
| 1. Demonstrate knowledge of types of tissues and their function
 | 1. ***Tissue function*** outlined as per the workplace procedures
2. Embryonic tissues identified as per the tissue location
3. Types of tissues identified as per the tissue location
 |
| 1. Demonstrate understanding of cell totipotency
 | * 1. The processes of cell regeneration are determined as per cell type
	2. ***Cell culture techniques*** are identified as per tissue origin
	3. Explants are regenerated from callus material
	4. Measurements of cell growth are determined as per plant organ and workplace procedures
 |
| 1. Understand basic DNA and gene function
 | * 1. Basic DNA structure is identified
	2. Basic DNA replication is determined as per type of protein
	3. Basic DNA transcription is determined as per type of RNA
	4. Basic DNA translation is determined as per type of protein
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variables** | **Range****May include but not limited to:** |
| 1. Cell types may include but not limited to
 | * Plant origin
* Animal origin
 |
| 1. Cell division levels may include but not limited to
 | * Anaphase
* Metaphase
* Prophase
* Telophase
 |
| 1. Type of tissues may include but not limited to
 | * Epithelial
* Connective
* Adipose
* Bone
* Nerve and muscle
 |
| 1. Staining methods may include but not limited to
 | * Hematoxylin and eosin
* Uranyl acetate and lead citrate
 |
| 1. Tissue function may include but not limited to
 | * Transportation
* Protection
* Growth and development
 |
| 1. Cell culture techniques may include but not limited to
 | * Embryo culture
* Pollen culture
* Tissue culture
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Analytical skills
* Communication skills
* Evaluation skills
* Problem solving
* Critical thinking
* Microscopy
* Cell culture

**Required Knowledge**

The individual needs to demonstrate knowledge in:

* Biomolecules
* DNA replication
* Basic cell structure
* Tissue culture
* Cell regeneration
* Physiological terminologies
* Histology and cytology

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Identify relevant cell structure and cell development terminology
	2. Identify cell types as per the workplace procedures
	3. Identified components of a cell as per the cell type
	4. Outlined processes of cell division as per the SOP
	5. Described the composition of cytoplasm as per the cell origin
	6. Performed microscopic observation based on microscope types
	7. Identified chemical, physical and histochemical methods based on the material available
	8. Identified immunohistochemical methods based on the material available
	9. Performed X-ray diffraction as per the workplace procedures
	10. Outlined tissue location as per the workplace procedures
	11. Identified embryonic tissues as per the tissue location
	12. Classified tissues as per the tissue location
	13. Demonstrated cell totipotency as per cell type
 |
| 1. Resource Implications for competence ertification
 | The following resources must be provided:* 1. Access to relevant workplace where assessment can take place
	2. Appropriately simulated environment where assessment can take place
	3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Written tests
	2. Practicals
	3. Third party reports
	4. Oral questioning
	5. Observation
 |
| 1. Context of Assessment
 | Assessment could be conducted:1. On-the-job
2. Off-the–job
3. During industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with related units in the sector |

# DEMONSTRATE BASIC KNOWLEDGE OF LABORATORY PRACTICE

**UNIT CODE:** MED/OS/BT/CC/03/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate basic knowledge of laboratory practice. It involves applying safety precautions in the laboratory, demonstrating basic understanding of laboratory design, carrying out basic repair and maintenance of equipment, handling laboratory chemicals/specimens, carrying out first aid operations procedures and keeping accurate inventory records.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**These are **assessable** statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the range.*** |
| 1. Apply safety precautions in the laboratory
 | * 1. Personal protection equipment and apparel (***PPEs***) are identified gathered and donned based on workplace procedures
	2. Occupational safety and health procedures are adhered to according to work place procedures.
	3. Equipment/apparatus and reagents/chemicals are handled as per manufacturers manual and work place procedures
	4. Safety signs are positioned according the laboratory risk management guidelines.
 |
| 1. Demonstrate basic understanding of laboratory design
 | * 1. Occupational safety and health procedures are adhered to according to work place procedures
	2. Laboratory sections are partitioned according to experimental requirements
	3. Laboratory utilities are determined based on the experimental test requirements
	4. Laboratory disposal systems are determined as per waste classification.
	5. Laboratory equipment position is determined as per the user and manufacturer guidelines
 |
| 1. Carry out basic repair and maintenance of equipment
 | * 1. Test equipment and/or reagents are set up as per specified test method.
	2. Pre-use and safety checks are conducted as per work place procedures
	3. The calibration status of equipment is checked as per work place procedures
	4. **Serviceability checks** are **performed on equipment as per manufacturer’s manual instruction and work place procedures**
	5. Routine maintenance is conducted as per manufactures manuals and workplace procedures
	6. **Calibration/qualification checks** are **performed as per work place procedures** and per manufactures manuals
 |
| 1. Handle laboratory chemicals/specimens
 | * 1. PPEs are identified based on standard safety requirements
	2. Laboratory chemicals/ specimens identified and labeled based on standard laboratory procedures
	3. Laboratory chemicals are classified and handled as per standard laboratory guidelines
	4. Laboratory chemicals are retrieved and used as per experimental requirements
	5. Chemical and chemical containers are disposed according to manufacturer’s guidelines, workplace procedures and biosafety set standards
	6. Unused and expired specimens are disposed as per ***biosafety regulations***
 |
| 1. Carry out first aid operations procedures
 | * 1. Nature of the accident/emergency is assessed as per work place procedure
	2. First aid method is determined according to ***DRSABCD***
	3. First aid kit is assembled is as per the nature of accident
	4. ***Emergency help*** is sort depending on the nature of the ***emergency***
	5. The nature of the accident is registered /reported as per the workplace procedure
 |
| 1. Keep accurate inventory records
 | * 1. Laboratory results are transcribed as per work place procedures
	2. Accuracy of ***records*** is verified as per work place procedures
	3. Records are filed and stored as per work place procedures
	4. Records confidentiality is maintained as per work place confidentiality standards
	5. Laboratory equipment /chemical inventory is accurately kept as per workplace procedure
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
|  |  |
|  |  |
| 1. Personal protective equipment (PPE) may include but not limited to:
 | * + Masks
	+ Gloves
	+ Safety hat
	+ Overall coats
	+ Gumboots
	+ Fume-cupboards
	+ Lamina flow bench
	+ Body showers
 |
| 1. biosafety regulations may include but not limited to
 | * NEMA
* OSHA codes
* National Biosafety Authority (NBA)
 |
| 1. DRSABCD may include but not limited to
 | * Danger
* Response
* Send for help
* Airway
* Breathing
* CPR (Cardiopulmonary Resuscitation)
* Defibrillator
 |
| 1. Emergency help may include but not limited to
 | * Medical personnel
* Fire brigade
* Ambulatory services
 |
|  |  |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge in:

**SKILLS**

The individual needs to demonstrate the following skills:

* Laboratory management
* Sampling techniques
* Computer
* Decision making
* Leadership
* Critical thinking
* Communication

**KNOWLEDGE**

* Levels of laboratories and designs
* Types of specimens
* Laboratory info mechanics
* Types of laboratory chemicals
* Laboratory standard operating procedures
* ICT
* Laboratory accidents, hazards and their prevention
* First aid

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1. Identified, gathered and used PPEs correctly and appropriately
2. Prepared laboratory specimen and samples
3. Performed laboratory tests
4. Maintained laboratory equipment
5. Recorded laboratory results
6. Kept and maintained accurate records
7. **Demonstrated understanding of laboratory practices**
8. Demonstrated understanding of fast techniques
9. Demonstrated understanding of record keeping
10. Demonstrated understanding of first aid techniques
 |
| 1. Resource Implications for competence certification
 |  The following resources must be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be accessed through:* 1. Written tests
	2. Practicals
	3. Oral questioning
	4. Third party reports
	5. Case studies
 |
| 1. Context of Assessment
 | Competency may be assessed:* 1. On the job
	2. Off the job
	3. In work placement (attachment)

Off the job assessment must be undertaken in a closely simulated workplace environment |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry subsector, workplace and job roles is recommended.  |

# DEMONSTRATE UNDERSTANDING OF RESEARCH PROJECT

**UNIT CODE:** MED/OS/BT/CC/04/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate understanding of a research project. It involves identifying a research problem, formulating hypothesis or research questions, conducting literature review, developing research design and methodology, preparing research proposals, conducting data collection, basic data analysis and presentation and preparing basic research report.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**These are **assessable** statements which specify the required level of performance for each of the elements.***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Identify a research problem
 | 1. Research problem is identified as per requirements of the industry
2. The scope of the study is defined as per the research problem
3. A research title is formulated based on objectives.
 |
| 1. Formulate hypothesis or research questions
 | 1. Research objectives are identified based on the title.
2. Research questions are established based on the objectives.
3. Hypothesis is formulated base on the research objective
 |
| 1. Conduct literature review
 | 1. ***Sources of information*** are identified, assessed and analyzed based on research objectives.
2. Relevant information is read and cited based on area of study
 |
| 1. Develop research design and methodology
 | 1. The locality/site of the study identified based on the research objective.
2. Materials, methods and procedures identified based on the research problem.
3. A schedule of the study prepared based on timeframe of the study.
4. Research budget prepared based on the scope of the research
5. ***Types of research design*** are identified and selected based on the research objectives.
6. ***Sampling techniques*** are selected and established in line with the research design.
7. ***Data analysis techniques*** are selected and established based on research objective and research design.
8. Validity and reliability of research instruments is determined as per the research design.
9. Research outputs are established based on research objectives
 |
| 1. Prepare research proposal
 | 1. Scope of a research proposal identified based on the research topic
2. Research proposal formulated based on the research topic
3. General topic is determined based on the industry
4. Literature review Performed
5. Gap in the literature is identified
6. Statement of the problem framed based on the gap identified
7. Research hypotheses and or research questions determined
8. Materials, methods and research design are determined based on research scope
9. Research budget and work plan is prepared
10. Data Collection and data analysis procedures are determined based on scope of the research objective
 |
| 1. Conduct data collection
 | * 1. Data collection tools identified based on the research design
	2. ***Sources of data*** are identified and assessed based on the research objective.
	3. ***Methods of data collection*** are identified, assessed and analyzed based on the research design.
	4. Data is collected in line with research objectives.
 |
| 1. Conduct basic data analysis and presentation
 | * 1. Data is analyzed and interpreted in line with research objectives.
	2. Data is processed and presented as per relevant methodology
	3. Data collected is analyzed as per SOPs
 |
| 1. Prepare basic research report
 | 8.1 Research report format identified as per relevant standards8.2 Research report prepared as per standards* 1. Research findings are determined as per work place procedures
	2. Research findings are presented as per SOPs
	3. Research conclusions are made as per analyzed report.
	4. Research recommendations are carried out based on the result
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| Variables | Range |
| 1. Sources of information
 | * Primary
* Secondary
 |
| 1. Types of research design
 | * Descriptive
* Experimental
* Case study
* Correlational
 |
| 1. Sampling techniques
 | * Systematic sampling
* Stratified
* Clustered
* snowball
 |
| 1. Data analysis techniques
 | * Hypothesis test
 |
| 1. Sources of data
 | * Primary
* Secondary
 |
| 1. Methods of data collection
 | * Questionnaire
* Interviewing
* Observation
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Organizing skills
* Analytical skills
* Negotiation skills
* Interpersonal skills
* Communication skills
* Evaluation skills
* Problem solving
* Critical thinking
* Presentation skills

**Required Knowledge**

The individual needs to demonstrate knowledge in:

* Research methods
* Technical report writing
* Communication skills
* Presentation skills

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1. Identified Research problem as per requirements of industry
2. Defined the scope of the study as per the research problem
3. Formulated a research title-based objective.
4. Identified Research objectives based on the title.
5. Established Research questions based on the objectives.
6. Identified Sources of information based on research objectives.
7. Reviewed and cited Relevant information is based on area of study
8. Identified the locality/site of the study based on the research objective.
9. Identified Materials, methods and procedures based on the research problem
10. Prepared a schedule of the study based on time frame of the study.
11. Prepared Research budget based on the scope of the research
12. Identified and selected Types of research design are based on the research objectives.
13. Data analysis techniques are selected and established research objective and research design.
14. Determined Validity and reliability of research instruments is as per the research design.
15. Developed a research proposal
16. Determined research design
17. Determined Data Collection Methods and data analysis Procedures
18. Identified Data collection tools based on the research design
19. Collected Data is in line with research objectives.
20. Analyzed and interpreted Data is in line with research objectives.
21. Processed and presented Data as per relevant methodology
22. Identified Research report format as per relevant standards
23. Prepared Research report as per standards
24. Determined and presented Research findings as per work place procedures
 |
| 1. Resource implications for competence certification
 | The following resources must be provided:* 1. Access to relevant workplace where assessment can take place
	2. Appropriately simulated environment where assessment can take place
	3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Written tests
	2. Third party reports
	3. Oral questioning
	4. Interview
	5. Observation
 |
| 1. Context of Assessment
 | Assessment could be conducted:1. On-the-job
2. Off-the–job
3. During industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with related units in the sector |

# CORE UNITS OF COMPETENCY

# PARTICIPATE IN BIOTECHNOLOGY RESEARCH ACTIVITIES

**UNIT CODE:** MED/OS/BT/CR/01/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to participate in biotechnology research activities. It involves Setting up operational equipment, handling laboratory chemicals, preparing chemical/ reagents, carrying out test and experiments, collecting and recording of research data and maintaining laboratory equipment.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**These are **assessable** statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the range.*** |
| 1. Set up operational

equipment | * 1. Personal protection equipment (***PPEs***) are identified and gathered based on experimental requirements
	2. Occupational safety and health procedures are adhered to according to work place procedures.
	3. The working space and laboratory section is identified according to the work place procedure.
	4. ***Instruments and equipment*** setup are arranged according to experimental objective
 |
| 1. Handle laboratory chemicals
 | * 1. PPEs are identified based on standard safety requirements
	2. ***Laboratory chemicals*** are identified based on standard laboratory procedures
	3. Laboratory chemicals are classified and stored as per standard laboratory guidelines
	4. Laboratory chemicals are retrieved and used as per experimental requirements
	5. Chemical disposal is done according to manufacturer’s guidelines, workplace procedures and biosafety set standards.
 |
| 1. Prepare chemical/ reagents
 | * 1. Personal protection equipment (PPEs) are identified and gathered based on experimental requirements
	2. Occupational safety and health procedures are adhered to according to work place procedures.
	3. Environmental protection measures are observed according to national environmental protection regulations
	4. Instruments and equipment setup is arranged according to chemical/reagent experimental objective.
	5. Reagents are prepared and labelled in accordance with test method requirements.
	6. Storage of reagents is done as per the workplace procedure.
 |
| 1. Carry out tests and experiments
 | * 1. PPEs are identified and gathered based on experimental requirements
	2. Occupational safety and health procedures are adhered to according to work place procedures.
	3. ***Environmental protection measures*** are observed according to environmental protection regulations and work place procedures
	4. The effect of dependable variable is measured as per experiment objectives
 |
| 1. Collect and record research data
 | * 1. Data is collected and gathered as per the experimental requirements
	2. Errors in data are rectified as per workplace procedures
	3. ***Standard evaluation system*** of data is carried out as per the experimental procedure
	4. Data summary is done as per work place procedure
	5. Basic experimental result conclusion and recommendation are prepared as workplace procedure.
	6. The records are filed and information is stored as per workplace procedures
 |
| 1. Maintain laboratory equipment
 | * 1. Personal protection equipment (PPEs) are identified and gathered based on workplace procedure
	2. Faulty and unsafe laboratory equipment are identified as per the equipment manual and workplace procedures
	3. Reporting and recording of the unsafe and faulty laboratory components and equipment are conducted according to workplace procedures
	4. Maintenance procedures and safety requirements are identified as per equipment manual
	5. Maintenance schedules are planned in accordance with standard operational procedures on the equipment manual
	6. Faults are repaired/ replaced as per equipment manual and work place procedures
	7. Equipment and Instruments are cleaned using recommended cleaning agents and techniques as per equipment manual and workplace procedures.
	8. Instruments and equipment are stored in accordance with workplace and/or manufacturer requirements
	9. Instruments and equipment are operated in accordance with workplace and/or manufacturer procedure
	10. Occupational safety and health procedures are adhered to according to work place procedures.
	11. Environmental protection measures are observed according to environmental protection regulations and work place procedures
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
| 1. Personal protective equipment (PPE) may include but not limited to:
 | * + Masks
	+ Gloves
	+ Safety hat
	+ Overall coats
	+ Gumboots
	+ Fume-cupboards
	+ Lamina flow bench
	+ Body showers
 |
| 1. Instruments and equipment may include but not limited to:
 | * + Centrifuges
	+ Flasks
	+ PCRs machine/Thermocylers
	+ Weighing balance
	+ Autoclaves
	+ Electrophoresis kits
	+ Laminar flow benches
	+ Spectrophotometer
	+ Computer
 |
| 1. Environmental protection measures may include but not limited to:
 | * + Methods of minimizing or stopping spread and ingestion of airborne particles
	+ Methods of minimizing or stopping spread and ingestion of gases and fumes
	+ Methods of minimizing or stopping spread and ingestion of liquids wastes
	+ Methods of minimizing or stopping spread noxious organisms
 |
| 1. Standard Evaluating Systems (SES) this may include but not limited to:
 | * + Number of plate counts
	+ Culture and sensitivity tests
	+ Titer volumes
	+ Number of plantlets
	+ Plant height
	+ Days to flowering
	+ Number of bands per primer
	+ Lethal doses
 |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

**SKILLS**

The individual needs to demonstrate the following skills

* Communication
* Data analysis
* Research techniques
* Decision making
* Management
* Leadership
* Troubleshooting

**REQUIRED KNOWLEDGE**

The individual needs to demonstrate knowledge in:

* Experimental methods
* Sampling methods
* Data collection
* Methods of data analysis (excel)
* Quality control
* Types of Laboratory
* Types of laboratory chemicals
* Types of laboratory equipment, items and hardware
* Information communication technology
* Equipment maintenance

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1. Demonstrated understanding of Personal protective equipment
2. Demonstrated understanding of Laboratory safety and practice
3. Demonstrated understanding of equipment and instruments set up
4. Carried out tests and experiments as required
5. Gathered and recorded research data correctly
6. Operated Laboratory computers and instruments as required
7. Maintained computer and laboratory equipment’s
8. Demonstrated understanding of research methods
9. Handled chemical disposal safely
 |
| 1. Resource Implications for competence certification
 | The following resources must be provided:* 1. Access to relevant workplace where assessment can take place
	2. Appropriately simulated environment where assessment can take place
	3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be accessed through:* 1. Written tests
	2. Oral questioning
	3. Third party reports
	4. Practical
	5. Case studies
 |
| 1. Context of Assessment
 | Competency may be assessed:1. On the job
2. Off the job
3. In work placement (attachment)

Off the job assessment must be undertaken in a closely simulated workplace environment |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry subsector, workplace and job roles is recommended.  |

#

# PREPARE MEDIA SOLUTION

**UNIT CODE:** MED/OS/BT/CR/02/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required in preparation of media solution. It involves Preparing media apparatus and equipment, preparing stock solutions, maintaining stock solution, preparing culture media, managing media storage and carrying out sterilization of media.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**These are **assessable** statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the range.*** |
| 1. Prepare media apparatus and equipment
 | * 1. Personal protection equipment and apparel ***(PPEs)*** are identified gathered and done based on experimental requirements
	2. Appropriate media apparatus and equipment are assembled based on experiment required
	3. Apparatus and equipment are cleaned and sterilized as per work place procedure and apparatus/equipment manual
	4. Apparatus and equipment are set based on the experimental requirements
 |
| 1. Prepare stock solutions
 | * 1. Personal protection equipment and apparel (PPEs) are identified gathered and donned based on experimental requirements
	2. Stock constituents are assembled as per the test and experiment
	3. Stock constituents are weighed, measured and diluted as per the test and experiment
	4. Stock constituents are mixed to make stock solution as per experiment requirements
	5. Stock solutions are labeled as per the date of preparation
	6. Stock solution is sterilized as per the nature of stock
	7. Stock solution is stored as per standards operating procedures
 |
| 1. Maintain stock solution
 | * 1. Period of stock solution preservation is determined as per the nature of work being done
	2. Method of preservation is chosen as per ***stock solution ingredients***
	3. ***Type of stock solution*** is determined as per experimental test
	4. Clear labels are created as per the stock solution
 |
| 1. Prepare culture media
 | * 1. PPEs are identified and gathered based on experimental requirements
	2. Apparatus and equipment for media preparation are identified and obtained as per ***type of media*** and ***inoculant*** to be introduced
	3. Media components are identified and assembled according to media preparation procedures
	4. Media ingredients are weighed as per planned tests
	5. Media ingredients are mixed as per preparation specifications
	6. Media PH is adjusted as per the test
	7. Media is dispensed into vessels for sterilization as per standard sterilization protocols and experimental requirements
	8. Lamina flow bench is cleaned and sterilized as per work place procedures
 |
| 1. Manage media storage
 | * 1. Media is labeled to allow tracking and selection in subsequent culturing processes
	2. Batch media is dated to ensure correct batch rotation
	3. Area of the culture vessel examination for contamination is handled as per work place policy
	4. Records of batches of media are maintained as per work place policy
	5. Media is stored and incubated as per SOPs
	6. Control plates are incubated as a sterility check
 |
| 1. Carry out media sterilization
 | * 1. Media sterilization methods and types are identified
	2. Sterilizer is loaded as per maximum permitted loads and appropriate positioning of materials as per equipment operational manual and Standard Operating procedures (***SOPs***)
	3. Sterilization indicator is correctly placed with the load to monitor sterilization process as per work place procedures and environmental protection regulations
	4. Sterilization cycle is operated in accordance with manufacturer requirements and type of media ingredients
	5. Media is cooled as per the temperature specified in the media formulation procedures and as per work place procedures
	6. Unused media is stored to maximize shelf life and minimize contamination as per work place policy
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
| 1. Personal protective equipment (PPE) may include but not limited to:
 | * + Masks
	+ Gloves
	+ Safety hat
	+ Overall coats
	+ Gumboots
	+ Fume-cupboards
	+ Lamina flow bench
	+ Body showers
 |
| 1. Culture media components and ingredients include but not limited to
 | * Water– Source of hydrogen and oxygen.
* Electrolytes– NaCl & other electrolytes.
* Peptone– Mixture of partially digested proteins (animal or vegetable)
* Meat extract, yeast extract – Protein degradation products/carbohydrates/Inorganic salts/Growth factors.
* Macro/Micro elements
* Gelling agents
* Carbon sources
	+ Blood– It enriches media
 |
| 1. Type of stock culture
 | * Working stock
	+ Primary stock
 |
| 1. Type of, media include but not limited to
 | * Solid
* Liquid
* Selective
* Differential
 |
| 1. Type of inoculants include but not limited to
 | * Bacteria
* Viruses
* Algae
* Fungi
* Explants
 |
| 1. Standard operating procedures (SOPs) include but not limited to.
 | * Load the media not to the brim of the media vessel
* Check the water level of the sterilizer
* Loosely cap the media vessel
* Labelling appropriately
 |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

**SKILLS**

The individual needs to demonstrate the following skills:

* Communication
* Culture preparation
* Sterilization
* Culture disposal
* Observation
* Data collection & interpretation
* Decision making
* Management
* Leadership

**REQUIRED KNOWLEDGE**

The individual needs to demonstrate knowledge in:

* Types of stock solutions
* Types of media cultures
* Microbiology
* Tissue culture
* Cell culture
* Types of sterilizations
* Types of sterilization equipment
* Types of culture vessels
* Storage requirements of different cultures
* Rules and guidelines in Biotechnology laboratory

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate1. Prepared media apparatus and equipment
2. Assembled stock solution constituents
3. Prepared media culture
4. Maintained culture stock
5. Monitored storage of media
6. Maintained media and equipment
7. Sterilized media culture equipment
 |
| 1. Resource Implications for competence certification
 | The following resources must be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be accessed through:* 1. Written tests
	2. Oral questioning
	3. Practicals
	4. Third party reports
	5. Observations
	6. Case studies
 |
| 1. Context of Assessment
 | Competency may be assessed:1. On the job
2. Off the job
3. In work placement (attachment)

(Off the job assessment must be undertaken in a closely simulated workplace environment) |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry subsector, workplace and job roles is recommended.  |

# MANAGE INDUSTRIAL WASTE

**UNIT CODE:** MED/OS/BT/CR/03/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to manage industrial waste. It involves classifying industrial wastes, managing industrial waste, controlling industrial pollution, utilizing industrial waste and cleaning and decommissioning of tanks.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**These are **assessable** statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the range.*** |
| * 1. Classify industrial waste
 | * 1. Personal protection equipment and apparel (PPEs) are identified based on industrial waste
	2. ***Industrial wastes* are** identified based on disposal waste management regulations
	3. Waste materials are categorized according to national environmental management authority.
 |
| * 1. Manage industrial waste
 | * 1. PPEs are identified gathered and donned based on industrial waste
	2. Occupational safety and health procedures are adhered to according to work place procedures
	3. Industrial waste is sorted as per their nature and environmental pollution effect
	4. Type of industrial waste to be treated is determined as per industry processes
	5. Legislations relating to industrial waste treatment are obtained and applied as per government policy
	6. Waste management systems are set up as per industrial waste legislation
	7. Environmental protection measures are observed according to environmental protection regulations and work place procedures
 |
| * 1. Control industrial pollution
 | * 1. PPEs are identified gathered and donned based on industrial waste
	2. Occupational safety and health procedures are adhered to according to work place procedures
	3. The nature of pollution is determined as per set standard and government policies
	4. Method of industrial pollution control is identified as per the nature of pollution
	5. Tools, equipment and materials for pollution control are obtained as per work place procedures
	6. Pollution is controlled according to the safety standards procedures
 |
| * 1. Utilize industrial waste
 | * 1. Nature of industrial waste is determined as per NEMA regulations
	2. Industrial waste is basically analyzed as per user needs
	3. **Properties of waste** are identified as per nature of industrial waste
	4. Industrial waste byproducts are produced as per user needs
 |
| * 1. Clean and decommission tanks
 | * 1. Personal protection equipment and apparel (***PPEs***) are identified based on industrial waste
	2. Occupational safety and health procedures are adhered to according to work place procedures.
	3. Environmental protection measures are observed according to environmental protection regulations and work place procedures
	4. Apparatus, tools, equipment and chemical reagents to be used are identified and gathered as per the work place procedures
	5. Cleaning of tanks is done according to work place procedures
	6. ***Decommissioning of materials*** are assembled as per the work place procedure
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
| 1. Waste may include but not limited to:
 | * + Biodegradable
	+ Non-biodegradable
 |
| 1. Properties of waste
 | * + Chemical
	+ Physical
	+ Biological
 |
| 1. Personal protective equipment (PPE) may include but not limited to:
 | * + Mask
	+ Cloves
	+ Safety hat
	+ Overall
	+ Gumboots
	+ Fume-cupboards
	+ Lamina flow bench
	+ Body showers
 |
| 1. Decommissioning of industrial materials may include but not limited to:
 | * Acids and alkalis.
* Slurries and drilling muds.
* Paints and adhesives.
* Leachates and contaminated waters.
* Interceptor and associated drainage waste.
* Sewage and grease trap waste.
* Waste hydraulic oils and soluble oils.
* Food waste.
* Bio wastes
	+ Animal waste
 |

**REQUIRED SKILLS AND KNOWLEDGE**

The individual needs to demonstrate:

**SKILLS**

The individual needs to demonstrate the following skills:

* Communication
* Handling industrial wastes
* Waste treatment
* Waste utilization
* Environmental conservation
* Decision making
* Management
* Leadership

**REQUIRED KNOWLEDGE**

The individual needs to demonstrate knowledge in

* Types of wastes
* Types of pollution
* Waste management systems
* Environmental biology and health
* Waste disposal
* Waste utilization
* Waste treatment
* Waste decommissioning

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1. Identified and used PPEs correctly and appropriately
2. Carried out industrial waste treatment
3. Demonstrated understanding of different types of wastes
4. Controlled industrial pollution
5. Utilized industrial wastes
6. Demonstrated waste classification
7. Demonstrated waste decommissioning

  |
| 1. Resource Implications for competence certification
 | The following resources must be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be accessed through:* 1. Written tests
	2. Oral questioning
	3. Practicals
	4. Third party reports
	5. Case studies
 |
| 1. Context of Assessment
 | Competency may be assessed:1. On the job
2. Off the job
3. In work placement (attachment)

Off the job assessment must be undertaken in a closely simulated workplace environment |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry subsector, workplace and job roles is recommended.  |

#

# IMPROVE ANIMAL PRODUCTION

**UNIT CODE:** MED/OS/BT/CR/04/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required in improving animal production. It involves Preparing animal feeds, implementing animal’s feeding programme, preventing and participating in the control of animal diseases and participating in animal breeding.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**These are **assessable** statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the range.*** |
| 1. Prepare animal feeds
 | * 1. Animal nutritional requirements are determined as per the animal nutritional requirements
	2. Animal ***feed production technologies*** are identified and applied based on animal nutritional requirements
	3. Ingredients for animal feeds production are prepared as per nutrition requirement
	4. Animal feed ingredients are weighed as per work place procedures
	5. Animal feeds are formulated as per animal nutritional needs
	6. Animal feeds are stored/preserved based on standard storage procedures
 |
| 1. Implement animal’s feeding programme
 | * 1. Sources of animal feeds is determined as per the animal feeding requirements
	2. Animal feeds ratio is balanced according to the required animal production objective
	3. Feeding ration is done to meet needs of the animal as per the work place requirements
	4. Animal feeding process and storage is designed as per the standards operating procedures and work place requirements
 |
| 1. Prevent and participate in the animal diseases control
 | * 1. Personal protection equipment and apparel ***(PPEs)*** are identified gathered and donned based on treatment requirements
	2. ***Animal diseases*** are determined as per biotechnological techniques
	3. Infected animals are isolated for disease***s*** sample collection as per standards operating procedures and work place ethics
	4. Disease identification samples are collected and analyzed according to ***SOPs***
	5. Vaccines are procured and administered according to KEVEVAPI standard guidelines and Information Network for Animal Productivity and Health (INAPH) guidelines
	6. Animal disease records are managed as per standard procedures
	7. Disease outbreak is notified according to legal requirements
 |
| 1. Participate in animal breeding
 | * 1. The personal protection equipment and apparel (PPEs) are identified gathered and donned based on breeding techniques
	2. Physical examination of the animal is conducted according to the standard operating procedures
	3. Tools and equipment are determined as per the standard operating procedures and work place requirements
	4. Fertility tests are determined as per the standards operating procedures and work place requirements
	5. ***Biotechnological method*** for breeding is determined as per workplace requirements
	6. Breeding is carried out as per the workplace objective
	7. Superior offspring are selected as per the workplace objective and Information Network for Animal Productivity and Health (INAPH) guidelines
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
| 1. Feed production technologies may include but not to:
 | * Hydroponics
* Silage technology
* Hay technology
* Tissue culture
* Bio fortification
* Concentrate formulation
 |
| 1. Personal protective equipment (PPE) may include but not limited to:
 | * + Mask
	+ Cloves
	+ Safety hat
	+ Overall coats
* Gumboots
 |
| 1. Animal diseases may include but not to:
 | * Viral diseases e.g. Lumpy skin, diseases fowl pox.
* Bacterial e.g. Anthrax e.g. mastitis
* Protozoan diseases e.g. trypanosomiasis
* Fungal diseases e.g. skin Dermatitis
* Nutritional diseases e.g. milk fever
 |
| 1. Standard operating procedures (SOPs) may include but not limited to.
 | * + Use stethoscope, thermometer, weighing band, ropes for restraining.
	+ Check for vital parameters e.g. temperatures, respiratory rate, heart rate/Pulse rates.
* Branding tools e.g. ear notch, marking rods
 |
| 1. Biotechnological methods may include but not limited
 | * Embryo culture
* Artificial insemination
* Invitro fertilization
* Cloning
 |
|  |  |

**REQUIRED SKILLS AND KNOWLEDGE**

**SKILLS**

The individual needs to demonstrate the following skills:

* Communication
* Animal handling
* Identification of sick animals
* Disease prevention and control
* Synthesis and evaluation
* Decision making
* Management
* Leadership
* Analytical
* Record keeping

**REQUIRED KNOWLEDGE**

The individual needs to demonstrate knowledge in:

* Animal diseases
* Genetics
* Animal nutrition and formulations
* Animal disease control and prevention

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1. Identified and used PPEs correctly and appropriately
2. Prepared animal feeds
3. Controlled animal diseases
4. Administered common treatment of animals’ diseases.
5. Demonstrated understanding of animal disease detection
6. Demonstrated understanding of biotechnological methods of animal improvement
 |
| 1. Resource Implications for competence certification
 | The following resources must be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be accessed through:* 1. Written tests
	2. Oral questioning
	3. Practicals
	4. Third party reports
	5. Case studies
 |
| 1. Context of Assessment
 | Competency may be assessed:1. On the job
2. Off the job
3. In work placement (attachment)

Off the job assessment must be undertaken in a closely simulated workplace environment |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry subsector, workplace and job roles is recommended.  |

# IMPROVE CROP PRODUCTION

**UNIT CODE:** MED/OS/BT/CR/05/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required in improving crop production. It involves Preparing plant materials, preparing experimental layouts, undertaking breeding activities, collecting and recording data.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**These are **assessable** statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the range.*** |
| 1. Prepare plant materials
 | * 1. The personal protection equipment and apparel ***(PPEs)*** are identified, gathered and donned based on experimental techniques
	2. ***Plant materials*** are assembled according to workplace procedures
	3. The plant materials are classified based on their agronomic traits as per workplace objective
	4. Treatment of the plant materials is determined as per workplace procedure
	5. Type of planting materials are determined based on ***Planting site***
 |
| 1. Prepare experimental layouts
 | * 1. The personal protection equipment and apparel (PPEs) are identified gathered and donned based on experimental techniques
	2. Planting site is identified based on breeding objective and workplace procedure
	3. ***Experimental design and layouts*** are developed based on workplace conditions
	4. Plant materials are sown according to workplace procedures
	5. Agronomic practices are carried out according to crop requirements
	6. Site demarcation is done according to number of plant materials.
 |
| 1. Undertake breeding activities
 | * 1. Personal protection equipment and apparel (PPEs) are identified gathered and donned based on workplace requirements
	2. Breeding methods (Tissue culture) are determined based on workplace procedures
	3. Parental plant materials are identified based on workplace objective and procedure
	4. ***Breeding activities*** are carried out based on workplace objective
	5. Selection of superior offspring is done based on ***breeding objective*** and workplaceprocedure
	6. Harvesting and storage of selected superior genotypes is done according to working objective and procedures
 |
| 1. Collect and record data
 | * 1. Method of data collection is determined according working objective and procedures
	2. Data collection, recording and summary evaluation of the offspring is done as per workplace objective
	3. Data recording materials are gathered according to working objective and procedures
	4. Data collection is done according to according working objective and procedures
	5. Data is organized according to breeding objective and workplace procedures
	6. Basic data analysis is done according to breeding objective and workplace procedures
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
| 1. Personal protective equipment (PPE) may include but not limited to:
 | * + Mask
	+ Cloves
	+ Safety hat
	+ Overall coats
	+ Gumboots
 |
| 1. Plant materials may include but not limited to :
 | * + Seed,
	+ Vegetative organs,
	+ Pollen
	+ Plant Cells
 |
| 1. Planting site may include but not limited to:
 | * Field
* Greenhouse
* Growth chambers
* Screenhouse
 |
| 1. Experimental design and layouts may include but not limited to:
 | * CRD
* RCBD
* Lattice
* Split plot
 |
| 1. Breeding activities may include but not limited to:
 | * Grafting
* Pollination
* Invitro culture
 |
| 1. Breeding objectives may include but not limited to:
 | * Biotic resistance
* Abiotic resistance
* Quality traits
* Agronomic traits
 |

**REQUIRED SKILLS AND KNOWLEDGE**

**SKILLS**

The individual needs to demonstrate the following skills:

* Communication
* Crop husbandry
* Experimental design
* Breeding skills
* Selection
* Disease prevention and control
* Synthesis and evaluation
* Decision making
* Management
* Leadership
* Analytical
* Record keeping

**REQUIRED** **KNOWLEDGE**

The individual needs to demonstrate knowledge in:

* Plant biotic and abiotic constraints
* Genetics
* Plant breeding
* Crop improvement
* Experimental design
* Communication
* Tissue culture

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Identified and used PPEs correctly and appropriately
	2. Prepared plant materials
	3. Prepared experimental layouts
	4. Demonstrated understanding of breeding activities
	5. Demonstrated understanding of data collection
 |
| 1. Resource Implications for competence certification
 | The following resources must be provided:* 1. Access to relevant workplace where assessment can take place
	2. Appropriately simulated environment where assessment can take place
	3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be accessed through:* 1. Written tests
	2. Oral questioning
	3. Practicals
	4. Third party reports
	5. Case studies
 |
| 1. Context of Assessment
 | Competency may be assessed:1. On the job
2. Off the job
3. In work placement (attachment)

Off the job assessment must be undertaken in a closely simulated workplace environment |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry subsector, workplace and job roles is recommended.  |

# PROCESS QUALITY FOOD

**UNIT CODE:** MED/OS/BT/CR/06/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required in processing quality food. It involves Preparing food materials, producing quality foods, preparing microbial enzymes, performing food tests and preserving processed food.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**These are **assessable** statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the range.*** |
| 1. Prepare food materials
 | * 1. Personal protection equipment and apparel (***PPEs***) are identified gathered and donned based on production requirements
	2. Food materials are obtained as per standard operating procedures and work place requirements
	3. Quality tests of food materials are performed as per food requirements and workplace procedure
 |
| 1. Produce quality food
 | * 1. Food processing techniques are determined as per objective and workplace procedures
	2. Cultures are identified as per the food being processed requirements
	3. Machine components and related attachments are fitted and adjusted as per standard operating procedures and machine manuals.
	4. Operating parameters are entered as per safety and production requirements
	5. Quality improvement processes are started and operated according to workplace procedures and standard operating procedures
	6. Equipment is monitored to identify variation in operating conditions
	7. The process is monitored as per specifications requirements
	8. The working area is maintained according to housekeeping standards
 |
| 1. Prepare microbial enzymes
 | * 1. Medium is sterilized batch-wise as per work place procedures
	2. Culture medium is formulated as per user needs
	3. Microorganisms are isolated in culture media as per work place procedures
	4. Inoculation is done as per the number of inoculums required
	5. Enzymes are purified as per work place procedures
 |
| 1. Perform food tests
 | * 1. Personal protection equipment and apparel (PPEs) are identified gathered and donned based on production requirements
	2. Test requests are received as per work place policies
	3. Test methods are identified as per test request
	4. Test equipment are obtained as per work place procedures
	5. Samples and standards are prepared as per food testing requirements
	6. Test procedures are performed on all sample and standards as per specified methods
	7. Test results are recorded and validated as per work place procedures
 |
| 1. Preserve processed food
 | * 1. Storage and ***preservation conditions*** are identified as per set standard requirements
	2. Storage conditions are monitored and regulated as per standard requirements
	3. Preservation guidelines are observed according to workplace procedures
	4. Labelling and packaging of processed food materials is done as per workplace procedures
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
| 1. Personal protective equipment (PPE) may include but not limited to:
 | * + Masks
	+ Gloves
	+ Safety hat
	+ Overall coats
	+ Gumboots
 |
| 1. Preservation conditions may include but not limited to
 | * + Cold room
	+ Food additives
 |
|  |  |

**REQUIRED SKILLS AND KNOWLEDGE**

**SKILLS**

The individual needs to demonstrate the following skills:

* Testing techniques
* Enzyme handling and storage
* Food analysis
* Preparation of starter cultures
* Food standardization
* Decision making
* Management
* Leadership

**REQUIRED KNOWLEDGE**

The individual needs to demonstrate knowledge in:

* Types of food productions
* Food cultures
* Food microbiology
* Food tests
* Food preservation
* Communication
* Food handling
* Food quality control

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills, knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1. Processed quality foods
2. Quality tests of food materials are performed
3. Carried out food tests and recorded findings
4. Preserved processed foods
5. Demonstrated understanding of quality food production
6. Demonstrated understanding of food testing methods
7. Demonstrated understanding of food storage and preservation
 |
| 1. Resource Implications for competence certification
 | The following resources must be provided:* 1. Access to relevant workplace where assessment can take place
	2. Appropriately simulated environment where assessment can take place
	3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be accessed through:* 1. Written tests
	2. Practicals
	3. Oral questioning
	4. Third party reports
	5. Case studies
 |
| 1. Context of Assessment
 | Competency may be assessed:1. On the job
2. Off the job
3. In work placement (attachment)

Off the job assessment must be undertaken in a closely simulated workplace environment |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry subsector, workplace and job roles is recommended.  |

# MAINTAIN BIOTECHNOLOGY LABORATORY

**UNIT CODE:** MED/OS/BT/CR/07/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required in maintaining biotechnology laboratory. It involves Collecting laboratory specimens and samples, preparing laboratory experiments, maintaining laboratory equipment, collecting and recording test data, keep**ing an accurate inventory records** and maintaining a safe work environment.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the **key outcomes** which make up **workplace function**. | **PERFORMANCE CRITERIA**These are **assessable** statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the range.*** |
| 1. Collect laboratory specimens and samples
 | * 1. Personal protection equipment and apparel (***PPEs***) are identified gathered and donned based on workplace procedures
	2. Samples to be collected are identified as per laboratory experiment procedures
	3. Samples are collected as per compliance requirements.
	4. Integrity of samples is maintained during sampling as per work place standards
	5. Laboratory samples are labeled, registered and recorded as per workplace procedures
	6. ***Laboratory samples*** are stored as per work place procedures
 |
| 1. Prepare laboratory experiments
 | * 1. Personal protection equipment and apparel (***PPEs***) are identified, gathered and donned based on workplace procedure
	2. Test samples received and documented as per work place procedures
	3. The integrity of samples is determined and preservation is done as per work place procedures
	4. Tests samples are sorted and labeled as per work place procedures
	5. Sample and standards to be tested are prepared as per experimental objective procedures
	6. Methods of analysis are identified and applied according to test requirements
	7. Unused samples /specimens/reagents are stored and wastes disposed as per ***biosafety regulations***
 |
| 1. Maintain laboratory equipment
 | * 1. Personal protection equipment and apparel(PPEs) are identified, gathered and donned based on workplace procedure
	2. Occupational safety and health procedures are observed according to Standard operating procedures
	3. Test equipment and/or reagents are set up as per specified test method.
	4. Pre-use and safety checks are conducted as per work place procedures
	5. The calibration status of equipment is checked as per manufacturers manual and work place procedures
	6. **Serviceability checks** are **performed on equipment as per** manufacturers manual and **work place procedures**
	7. Routine maintenance is conducted as per manufactures manuals and workplace procedures
 |
| 1. Collect and Record Test data
 | * 1. Personal protection equipment and apparel (PPEs) are identified, gathered and donned based on workplace procedure
	2. Test data is obtained and observation recorded as per work place procedures
	3. Test data is verified for consistence with reference standards and controls as per the per work place procedures
	4. Data report is communicated as per the per work place procedures
 |
| 1. **Keep accurate inventory records**
 | * 1. Laboratory equipment, chemicals and consumables are identified and labeled as per work place procedures
	2. Stock taking of laboratory consumables is done as per work place procedures
	3. Accuracy of records is verified as per work place procedures
	4. Records are filed and stored as per work place procedures
	5. Records confidentiality is maintained as per work place confidentiality standards
 |
| 1. Maintain a safe work environment
 | * 1. Personal protection equipment and apparel (PPEs) of laboratory are used as per the laboratory procedures
	2. Generation of waste materials is minimized as per the work place procedures
	3. Waste disposal was conducted safely including of hazardous waste and tested samples as per the standard working procedures
	4. Laboratory, equipment and reagents are cleaned, store and cared for as per the work place procedures
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
|  |  |
|  |  |
| **Personal protective equipment (PPE)** may include but not limited to:  | * + Masks
	+ Gloves
	+ Safety hat
	+ Overall coats
	+ Gumboots
	+ Fume-cupboards
	+ Lamina flow bench
	+ Body showers
 |
| **Laboratory samples** may include but not limited to | * Animal samples
* Plant samples
	+ Microbial samples
 |
| **Biosafety regulations and codes** may include but not limited to: | * Biosafety act
* National Environmental Management Authority (NEMA)
* OSHA codes
* Kenya bureau of Standards
 |
|  |  |

**REQUIRED SKILLS AND KNOWLEDGE**

**SKILLS**

The individual needs to demonstrate the following skills:

* Laboratory management
* Sampling techniques
* ICT
* Data collection
* Communication skills
* Analytical skills
* Decision making
* Leadership

**REQUIRED KNOWLEDGE**

The individual needs to demonstrate knowledge of:

* Communication
* Levels of laboratories
* Types of specimens
* Laboratory info mechanics
* Types of laboratory chemicals
* Record keeping
* Data collection
* Laboratory standard operating procedures
* ICT
* Laboratory accidents, hazards and first aid

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Identified, gathered and used PPEs correctly and appropriately
	2. Prepared laboratory specimen and samples
	3. Performed laboratory tests
	4. Maintained laboratory equipment
	5. **Demonstrated understanding of laboratory practices**
	6. Demonstrated understanding of sampling techniques
	7. Demonstrated understanding of record keeping
	8. Demonstrated understanding of first aid techniques
 |
| 1. Resource Implications
 | The following resources must be provided:* 1. Access to relevant workplace where assessment can take place
	2. Appropriately simulated environment where assessment can take place
	3. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency may be accessed through:* 1. Written tests
	2. Oral questioning
	3. Practicals
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	5. Case studies
 |
| 1. Context of Assessment
 | Competency may be assessed:* 1. On the job
	2. Off the job
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Off the job assessment must be undertaken in a closely simulated workplace environment |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry subsector, workplace and job roles is recommended.  |