

**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**ENVIRONMENTAL TECHNICIAN**

**LEVEL 5**

**PROGRAMME CODE: 0521 454 A**

First published 2024

Revised 2025

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**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 the 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. These reforms resulted to the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No.14 of 2012). 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, certification be based on demonstration of competence and mode of delivery allows for multiple entry and exit in TVET programmes.

The reforms also 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 Education and Training (CBET) curriculum for Environmental Science Technician Level 5. These Occupational Standards will also be the basis for the assessment of an individual for competency certification.

It is my conviction that these Occupational Standards will play a great role in the development of a competent human resource for sustainable development.

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 2012 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 the industry as well as increase the global competitiveness of the Kenyan labour force.

The National Polytechnics, in conjunction with the industry experts through the Industry Advisory Board (IAB), sector regulator boards, TVETA authority, and qualification awarding institution has developed these Occupational Standards for Environmental Science Technician Level 5. The occupational standards will be the basis for the development of a competency-based education and training curriculum for Environmental Science Technician Level 5.

I am grateful to the Governing Council Members, TVETA, sector regulators, the industry experts, and subject experts who participated in the development of these standards.

**ACKNOWLEDGMENT**

These Occupational Standards were developed through the 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 input towards the development of these Occupational Standards.

I also thank all the individuals and organizations who participated in the validation of these Occupational Standards.

# KEY TO UNIT CODE

Sector / Industry

Sub Sector

Occupational Area

Version Control

Unit of Competence Number

ISCED level, Programme Orientation and Level of Completion

xx

x

xxx

x

x

x

**COURSE OVERVIEW**

Environmental ScienceLevel 5 qualification consists of competencies required by a person to enable him/her to perform the duties of a Environent technician level 5.These competencies include Digital literacy, Apply in organic and organic chemistry, Apply communicatin skills,performing environmental ecology maintenance, monitoring natural resources, performing environmental waste management, monitoring environmental pollution, Perform environmental health and safety practices, Apply natural resource economics, monitoring Climate change, Apply work ethics and practices, Apply entrepreneural skills, Perform labortory techniques, Apply environmental principles and monitor natural resources.

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# SUMMARY OF UNITS OF COMPETENCY

|  |  |
| --- | --- |
| UNIT CODE | UNIT TITLE |
| BASIC UNITS OF COMPETENCY | |
| 0611 451 01A | Apply Digital Literacy |
| 0031 441 05A | Apply Communication Skills |
| 0417 441 10A | Apply Work Ethics and Practices |
| 0031 441 11A | Apply Entrepreneurial Skills |
| COMMON UNITS OF COMPETENCY | |
| 0531 441 04A | Apply inorganic and organic chemistry |
| 0711 451 05A | Perform laboratory techniques |
| 0521 441 06A | Apply Environmental Principles |
| 0521 441 07A | Apply natural resource economics |
|  |  |
| CORE UNITS OF COMPETENCY | |
| 0521 451 08A | Monitor environmental pollution |
| 0521 451 09A | Monitor Climate change |
| 0521 451 10A | Perform environmental waste management |
| 0521 451 11A | Perform Environmental health and safety practices |
| 0521 451 12A | Perform environmental ecology maintenance |
| 0521 451 13A | Monitor natural resources |

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# BASIC UNITS OF COMPETENCY

# APPLY DIGITAL LITERACY

UNIT CODE: 0611 451 01A

**UNIT DESCRIPTION:**

This unit covers the competencies required to demonstrate digital literacy. It involves operating computer devices, solving tasks using the Office suite, accessing online/offline data and information, performing online communication and collaboration, applying cybersecurity skills and performing jobs online. It also involves applying job entry techniques.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes that make up workplace functions | **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. Operate computer devices | * 1. C***omputer device*** usage is determined as per workplace requirements.   2. ***Computer hardware*** is identified according to job requirements.   3. ***Computer software*** is identified according to workplace requirements.   4. Computer devices are turned on or off as per the correct workplace procedure.   5. ***Mouse techniques*** are applied in solving tasks as per workplace requirements.   6. Keyboardtechniques are applied in solving tasks as per workplace requirements.   7. Computer files and folders are created and managed as per workplace requirements.   8. ***Internet connection option***s are identified and applied in connecting computer devices to the Internet.   9. ***External devices*** are identified and connected to the computer devices as per the job requirement. |
| 1. Solve tasks using Office suite | 1. ***Word processing concepts***are applied in solving workplace tasks as per job requirements. 2. Worksheet data is entered and prepared in accordance with work procedures. 3. Worksheet data is built and edited in accordance with workplace procedures. 4. ***Data manipulation*** on a worksheet is undertaken in accordance with work requirements. 5. Worksheets are saved and printed in accordance with job requirements. 6. ***Electronic presentation concepts***are applied in solving workplace tasks as per job requirements. |
| 1. Manage data and information | * 1. Office ***internet services*** are identified and applied in accordance with office procedures.   2. ***Internet access applications*** are determined in accordance with office operation procedures.   3. Internet search is performed as per job requirements.   4. Online digital content is downloaded in accordance with workplace requirements.   5. Digital content is identified and backed up in accordance with workplace procedures. |
| 1. Perform online communication and collaboration | * 1. Netiquette principles are observed as per work requirements.   2. Electronic mail communication is executed in accordance with workplace policy.   3. Digital content copyright and licenses are identified and applied according to workplace policies and regulatory requirements.   4. ***Online*** ***collaboration tools*** are applied in accordance with workplace policies and regulatory requirements. |
| 1. Apply cybersecurity skills | * 1. ***Data protection*** and ***privacy*** is classified in accordance with workplace policies and regulatory requirements.   2. ***Internet security threats*** are identified as per workplace policies and regulatory requirements.   3. Computer threats and crimes are detected in accordance to Information Management security guidelines   4. ***Cybersecurity control measures*** are applied in accordance with workplace policies and regulatory requirements. |
| 1. Perform online jobs | * 1. ***Online job platforms*** are identified as per the job requirements.   2. Online accounts and profiles are created in accordance with the work requirements.   3. Online jobs are identified according to the bidder’s skillset.   4. Online digital identity is managed according to industry best practices.   5. Online job bidding is done as per the specific job requirements.   6. Online tasks are executed according to the job requirements.   7. Personal online payment account is managed in accordance with financial regulations. |
| 1. Apply job entry techniques | * 1. ***Job opportunities*** are sought based on competencies.   2. A winning resume/CV is developed as per job advertisement.   3. An application/cover letter is developed based on the job advertisement.   4. ***Certificates and testimonials*** are organized as per resume.   5. ***Interview skills*** are demonstrated as per job advertisement. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| 1. ***Computer devices*** may include but are not limited to: | * Desktops * Laptops * Smartphones * Tablets * Smart watches |
| 1. ***Computer hardware*** may include but are not limited to: | * The System Unit E.g. Motherboard, CPU, casing, * Input Devices e.g. pointing, keying, scanning, voice/speech recognition, direct data capture devices. * Output Devices e.g. hardcopy output and softcopy output * Storage Devices e.g. main memory e.g. RAM, secondary storage (Solid state devices, Hard Drives, CDs & DVDs, Memory cards, Flash drives * Computer Ports e.g. HDMI, DVI, VGA, USB type C etc. |
| 1. ***Computer software*** may include but are not limited to: | * System software e.g. Operating System (Windows, Macintosh, Linux, Android, iOS) * Application Software e.g. Word Processors, Spreadsheets, Presentations etc. * Utility Software e.g. Antivirus programs |
| 1. ***External devices*** may include but are not limited to: | * Printers * Projectors * Smart Boards * Speakers * External storage drives * Digital/Smart TVs |
| 1. ***Word processing concepts*** may include but are not limited to: | * Creating word documents * Editing word documents * Formatting word documents * Saving word documents * Printing word documents |
| 1. ***Mouse technique***s may include but are not limited to: | * Clicking * Double-clicking * Right-clicking * Drag and drop |
| 1. ***Internet connection options*** may include but are not limited to: | * Mobile Networks/Data Plans * Wireless Hotspots * Cabled (Ethernet/Fiber) * Dial-Up * Satellite * ISDN (Integrated Services Digital Network) |
| 1. ***Data manipulation*** may include but are not limited to: | * Use of formulae * Use of functions * Sorting * Filtering * Visual representation using charts |
| 1. ***Electronic presentation*** concepts may include but are not limited to: | * Creating slides * Editing slides * Formatting slides * Applying slide effects and transitions * Creating and playing slideshows * Saving presentations * Printing slides and handouts |
| 1. ***Internet services*** may include but are not limited to: | * Communication Services * Information Retrieval Services * File Transfer * World Wide Web Services * Web Services * Directory Services * Automatic Network Address Configuration * NewsGroup * Ecommerce |
| 1. ***Internet access applications/software*** may include but are not limited to: | * Browsers * Email Apps * eCommerce Apps |
| 1. ***Online collaboration tools*** may include but are not limited to: | * Online Storage * Online productivity applications * Online meetings, * Online learning environments, * Online calendars * Social networks |
| 1. ***Data protection and privacy*** may include but not limited to: | * Confidentiality of data/information * Integrity of data/information * Availability of data/information |
| 1. Internet security threats may include but not limited to: | * Malware attacks * Social engineering attacks * Software supply chain attacks * Advanced persistent threats (APT) * Distributed denial of service (DDoS) * Man-in-the-middle attack (MitM) * Password attacks * IoT Attacks * [Phishing Attacks](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#phishing-attacks) * [Ransomware](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#ransomware) |
| 1. ***Security threats control measures*** may include but not limited to: | * Counter measures against cyber terrorism * Physical Controls * Technical/Logical Controls * Operational Controls |
| 1. ***Online job platforms*** may include but are not limited to: | * Remotask * Data annotation technology * Cloudworker * Upwork * Oneforma * Appen |
| 1. ***Job opportunities*** may include but not limited to: | * Self-employment * Service provision * product development * salaried employment |
| 1. ***Certificates and testimonials*** may include but not limited to: | * Academic credentials * Letters of previous employments/ services rendered * Letters of commendation * Certifications of participation * Awards |
| 1. ***Interview skills*** may include but not limited to: | * Listening skills * Grooming * Language command * Articulation of issues * Body language * Time management * Honesty * Generally knowledgeable in current affairs and technical area |

**REQUIRED KNOWLEDGE AND SKILLS**

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

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Computer Hardware and Software Concepts
* Computer Security Concepts (Data security and privacy)
* Cyber security threats and control measures
* Understanding Computer Crimes
* Detection and protection against computer crimes
* Laws governing protection of ICT in Kenya
* Digital Identity Management
* Netiquette Principles
* Fundamentals of Copyright and Licenses
* Word processing;
* Functions and concepts of word processing;
* Documents and tables creation and manipulations;
* Document editing;
* Document formatting;
* Word processing utilities
* Spreadsheets;
* Meaning, types and importance of spreadsheets;
* Components of spreadsheets;
* Functions, formulae, and charts, uses and layout;
* Data formulation, manipulation and application to cells;
* Editing & formatting spreadsheets;
* Presentation Packages;
* Types of presentation Packages.
* Creating, formulating, running, editing, printing and presenting slides and handouts
* Networking and Internet;
* Internet connectivity.
* Browser and digital content management;
* Managing data, information, and digital content
* Electronic mail and World Wide Web
* Fundamentals of Online Working;
* Online Profile Management;
* e-Portfolio Management;
* Online Jobs Bidding;
* Online Payment Systems;
* Job entry techniques
* Job searching sites
* Interview preparation skills
* Interview handling

**Required skills**

The individual needs to demonstrate the following skills:

* Active listening
* Keyboard Skills
* Mouse Skills
* Analytical skills
* Creativity
* Interpretation Skills
* Communication
* Spreadsheet operations (applying fundamental operations such as addition, subtraction, division and multiplication)
* Computer Use Safety Skills
* Document Editing Skills
* Document Formatting Skills
* Document Printing Skills
* Netiquette Skills
* Internet Browsing Skills
* Problem Solving Skills
* Online Collaboration Skills
* Cybersecurity Skills
* CV writing
* grooming

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate:***   * 1. Operated computer devices as per workplace policies and regulations.   2. Solved tasks using the office suite as per workplace policies and regulations.   3. Manage data and information as per workplace policies and regulations.   4. Performed online communication and collaboration as per workplace policies and regulations.   5. Applied cybersecurity skills in accordance with workplace policies and regulations.   6. Executed online tasks according to the job requirements.   7. Searched for job opportunity based on competencies.   8. Prepared job requirement documentations based on job opportunity.   9. Demonstrated interview skills based on the job opportunity. |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments where assessment can take place.   3. Resources relevant to the proposed activities or task. |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral assessment   3. Portfolio of evidence   4. Interviews   5. Third party report   6. Written assessment   7. Practical assessment   8. Projects |
| 1. Context of assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |

# 

# APPLY COMMUNICATION SKILLS

UNIT CODE: 0031 441 2A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate communication skills. It involves applying communication channels, written, non-verbal, oral, and group communication skills.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes that make up workplace function | **PERFORMANCE CRITERIA**  These are assessable statements that specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| --- | --- |
| 1. Apply communication channels | 1. Specific communication channels are identified and applied based on workplace requirements. 2. Challenges are identified and addressed as per the operational standards of the organization. 3. Communication channels are evaluated to meet workplace needs. |
| 1. Apply written communication skills | * 1. Types of written communication are identified and applied according to the workplace requirements.   2. Written communication needs are identified and implemented according to workplace procedures.   3. Written communication guidelines are analyzed, evaluated, and revised based on workplace needs. |
| 1. Apply non-verbal communication skills | 3.1 Existing non-verbal communication techniques are identified and applied based on organization policy.  3.2 Non-verbal communication techniques are articulated and modeled to enhance inclusivity according to workplace requirements. |
| 1. Apply oral communication skills | 4.1 Types of oral communication are identified and established as per organization policy.  4.2 Pathways of oral communication are identified and established as per organization policy.  4.3 Pathways of oral communication are reviewed according to organization procedures.  4.4 Pathways of oral communication are maintained according to the organization standards. |
| 1. Apply group communication skills | 1. Group communication strategies are appliedbased on the workplace needs. 2. Groups are organized in accordance with workplace procedures. 3. Effective questioning, listening and non-verbal communication techniques are used as per needs.   5.4 Group communication challenges are identified and addressed according to the workplace needs. |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| 1. Communication strategies may include but are not limited to: | * Language switch * Comprehension check * Repetition * Asking confirmation * Paraphrasing * Clarification request * Translation * Restructuring * Generalization |
| 1. Effective group interaction may include 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 |
| 1. Situations may include but are not limited to: | * Establishing rapport * Eliciting facts and information * Facilitating resolution of issues * Developing action plans |

**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:

* Active listening
* Interpretation
* Negotiation
* Writing
* Oral skills
* Creative thinking
* Critical thinking
* Decision making
* Analytical
* Innovation
* Conflict skills
* Leadership
* Problem solving skills
* Management
* Organizational
* Teamwork

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Communication process
* Dynamics of groups
* Styles of group leadership
* Key elements of communications strategy
* Principles of effective communication
* Turn-taking techniques
* Conflict resolution techniques
* Work planning
* Work organization
* Company policies
* Company operations and procedure standards
* Fundamental rights at the workplace
* Personal hygiene
* Accountability
* Workplace problems and how to deal with them

**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. Identified and applied specific communication channels based on workplace requirements.   2. Identified and applied specific written communication correspondence according to the workplace requirements.   3. Applied and developed non-verbal strategies to communicate in all areas of the workplace requirements.   4. Established pathways of oral communication as per workplace policy.   5. Applied group communication strategies based on workplace needs. |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place. 2. Appropriately simulated environment where assessment can take place. 3. Resources relevant to the proposed activity or tasks. |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral assessment   3. Portfolio of evidence   4. Interviews   5. Third party report   6. Written assessment   7. Practical assessment   8. Projects |
| 1. Context of Assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**APPLY WORK ETHICS AND PRACTICES**

UNIT CODE: 0417 441 3A

**UNIT DESCRIPTION**

This unit covers competencies required to effectively apply work ethics and practices. It involves the ability to: conduct self-management, promote ethical work practices and values, promote teamwork, manage workplace conflicts, maintain professional and personal development, apply problem-solving and promote customer care.

**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 Range*** |
| --- | --- |
| Apply self-management skills | 1. Personal vision, mission and goals are formulated based on potential and concerning organization objectives and strategic plan 2. Self-esteem and a positive self-image are developed and maintained based on value 3. Emotional intelligence and stress management are demonstrated as per workplace requirements. 4. Assertiveness is developed and maintained based on the requirements of the job. 5. Accountability and responsibility for one's actions are demonstrated based on workplace instructions. 6. Time management, attendance and punctuality are observed as per the organization’s policy. 7. Personal goals are managed as per the organization’s objective 8. Self-strengths and weaknesses are identified based on personal objectives 9. Motivation, initiative and proactivity are utilized as per the organization policy 10. Individual performance is evaluated and monitored according to the agreed targets. |
| 1. Promote ethical work practices and values | 1. Integrity is demonstrated as per acceptable norms 2. Codes of conduct is applied as per the workplace requirements 3. Policies and guidelines are observed as per the workplace requirements 4. Professionalism is exercised in line with organizational policies |
| 1. Promote Team work | * 1. ***Teams*** are formed to enhance productivity based on organization’s objectives   2. Duties are assigned to teams under the organization policy.   3. Team activities are managed and coordinated as per set objectives.   4. Team performance is evaluated based on set targets as per workplace policy.   5. ***Conflicts*** are resolved between team members in line with organization policy.   6. Gender and diversity-related issues are identified and mainstreamed in accordance with workplace policy.   7. Healthy ***relationships*** are developed and maintained in line with the workplace.   8. Adaptability and flexibility are applied in dealing with team members as per workplace policies |
| 1. Maintain professional and personal development | 1. ***Personal growth and development*** needs are identified and assessed in line with the requirements of the job. 2. ***Training and career opportunities*** are identified and utilized based on job requirements. 3. ***Resources*** for training are mobilized and allocated based on organizations and individual skills needs. 4. Licenses and certifications relevant to the job and career are obtained and renewed as per policy. 5. Recognitions are sought as proof of career advancement in line with professional requirements. 6. Work priorities and personal commitments are balanced and managed based on the requirements of the job and personal objectives. 7. Dynamism and on-the-job learning are embraced in line with the organization’s goals and objectives. |
| 1. Apply Problem solving skills | * 1. ***Creative, innovative*** and practical solutions are developed based on the problem   2. Independence and initiative in identifying and solving problems are demonstrated based on the requirements of the job.   3. Team problems are solved as per the workplace guidelines   4. Problem-solving strategies are applied as per the workplace guidelines   5. Problems are analysed and assumptions tested as per the context of data and circumstances |
| 1. Promote Customer Care | * 1. Customers' needs are identified based on their characteristics   2. Customer ***feedback*** is allowed and facilitated in line with organization policies.   3. Customer concerns and complaints are analyzed and resolved in line with the set organizational culture.   4. Proactive customer outreach programs are implemented as per organizational policies   5. Customer retention strategies are developed and implemented in line with the organizational policy |

**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. ***Feedback*** may include but not limited to: | * Verbal * Written * Informal * Formal |
| 1. ***Conflicts*** include but are not limited to: | * Interpersonal Conflict. * Intrapersonal Conflict. * Intergroup Conflict. * Intragroup Conflict. |
| 1. ***Relationships*** may include but not limited to: | * Man/Woman * Trainer/trainee * Employee/employer * Client/service provider * Husband/wife * Boy/girl * Parent/child * Sibling relationships |
| 1. ***Team*** may include but not limited to: | * Small work group * Staff in a section/department * Inter-agency group * Virtual teams |
| 1. ***Personal growth*** may include 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 |
| 1. ***Personal objectives*** may include but not limited to: | * Long term * Short term * Broad * Specific |
| 1. ***Trainings and career opportunities*** may include but not limited to | * Participation in training programs * Serving as Resource Persons in conferences and workshops * Capacity building |
| 1. ***Resource*** may include may but not limited to: | * Human * Financial * Technology |
| 1. ***Creative and innovative*** may include but not limited to: | * New ideas * Original ideas * Different ideas * Methods/procedures * Processes * New tools |
| 1. ***Emerging issues*** may include but not limited to: | * Artificial Intelligence * Data confidentiality * National cohesion * Open offices |

**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:

* Active listening
* Critical thinking
* Organizational
* Negotiation
* Monitoring
* Evaluation
* Problem solving
* Decision Making
* Leadership
* Creative/innovative thinking
* Adaptability
* Conflict management
* Emotional intelligence
* Teamwork

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Work values and ethics
* Company policies and procedures
* Company operations, procedures and standards
* Flexibility and adaptability
* Concept of time and leisure time
* Decision making
* Work planning
* Organizing work
* Monitoring and evaluation
* Record keeping
* Gender and diversity mainstreaming
* Drug and substance abuse
* Professional growth and development
* creativity
* Innovation
* problem solving
* customer care
* mentoring and coaching.
* Emerging 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 require evidence that the candidate:   * 1. Applied self-management skills as per organizational procedures.   2. Promoted ethical practices and values as per organizational procedures.   3. Promoted Teamwork as per workplace assignments.   4. Maintained professional and personal development as per organizational procedures.   5. Applied Problem-solving skills based on work requirements.   6. Identified customer needs based on their characteristics.   7. Gave back Customer feedback in line with organization policies. |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place. 3. Resources relevant to the proposed activity or tasks. |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Written test 4. Portfolio of Evidence 5. Interview 6. Third party report |
| 1. Context of Assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# APPLY ENTREPRENEURIAL SKILLS

**UNIT CODE: 0413 441 4A**

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate an understanding of entrepreneurship. It involves demonstrating an understanding of financial literacy, applying entrepreneurial concepts identifying entrepreneurship opportunities, applying business legal aspects, developing business innovative strategies, and developing business plans.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes that make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements that specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in Range*** |
| --- | --- |
| 1. Apply Financial Literacy Skills | 1. ***Sources of personal and business******funds*** are identified as per financial procedures and standards 2. Personal finances are managed as per financial procedures and standards 3. Savings are managed as per financial procedures and standards 4. Debts are managed as per financial procedures and standards 5. Investments are undertaken as per financial procedures and standards 6. Insurance services are procured as per financial procedures and standards |
| 1. Apply entrepreneurial concept | 1. Entrepreneurs and Business persons are distinguished as per principles of entrepreneurship 2. ***Types of entrepreneurs*** are identified as per principles of entrepreneurship 3. Ways of becoming an entrepreneur are identified as per principles of Entrepreneurship 4. ***Characteristics of Entrepreneurs*** are identified as per principles of Entrepreneurship 5. Salaried employment and self-employment are distinguished as per principles of entrepreneurship 6. ***Requirements for entry into self-employment*** are identified according to business procedures and standards 7. Roles of an Entrepreneur in an enterprise are determined according to business procedures and standards 8. **Contributions of entrepreneurship** to National development are identified as per business procedures and standards |
| 1. Identify entrepreneurial opportunities | 1. Business ideas are identified as per business procedures and standards 2. Factors to consider when evaluating business opportunity viability are explored based on business procedure and standards 3. Entrepreneurial opportunities are evaluated as per business procedures and standards 4. Business ideas and opportunities are generated as per business procedures and standards 5. Business life cycle is analyzed as per business procedures and standards |
| 1. Apply business legal aspects | 1. ***Forms of business ownership*** are identified as per legal procedures and practices 2. Business Registration and Licensing processes are identified as per legal procedures and practices 3. Types of Contracts and Agreements are analyzed as per legal procedures and practices 4. Employment Laws are identified as per legal procedures and practices 5. Taxation laws are identified as per legal procedures and practices |
| 1. Innovate Business strategies | 1. Business innovation strategies are determined by the organization standards 2. Creativity in business development is demonstrated in accordance with business standards 3. ***Innovative business standards***  are developed as per business principles 4. Linkages with other entrepreneurs are created as per best practice 5. ICT is incorporated in business growth and development as per best practice |
| 1. Develop Business Plan | 1. Business idea is described as per business procedures and standards 2. Business description is developed as per business plan format 3. Marketing plan is developed as per business plan format 4. Organizational/Management plan is prepared in accordance with business plan format 5. Production/operation plan is prepared in accordance with business plan format 6. Financial plan is prepared in accordance with the business plan format 7. Executive summary is prepared in accordance with business plan format 8. Business plan is presented as per best practice 9. Business ideas are incubated as per institutional policy. |

**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. ***Sources of personal funds*** mayinclude but not limited to: | * Salary/Wages * Investments * Savings * Inheritance * Government Benefits |
| 1. ***Sources of business finance*** mayinclude but not limited to: | * Equity Financing * Debt Financing, * Personal Savings/Investment * Retained Earnings * Grants and Subsidies * Crowd funding * supplier Credit: * Leasing and Asset Financing: |
| 1. ***Types of entrepreneurs*** may include but not limited to: | * Innovators * Imitators * Craft * Opportunistic * Speculators |
| 1. ***Characteristics of Entrepreneurs*** may include but not limited to: | * Creative * Innovative * Planner * Risk taker * Networker * Confident * Flexible * Persistent * Patient * Independent * Future oriented * Goal oriented |
| 1. ***Requirements for entry into self-employment*** may include but not limited to | * Technical skills * Management skills * Entrepreneurial skills * Resources * Infrastructure |
| 1. ***Forms of businesses ownership*** may include but not limited to: | * Sole proprietorship * Partnership * Limited companies * Cooperatives |
| 1. ***Innovative business standards*** may include but not limited to: | * New products * New methods of production * New markets * New sources of supplies * Change in industrialization |

**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
* Management
* Problem-solving
* Root-cause analysis
* Communication

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Decision making
* Business communication
* Change management
* Competition
* Risk
* Net working
* Time management
* Leadership
* Factors affecting entrepreneurship development
* Principles of Entrepreneurship
* Features and benefits of common operational practices, e. g., continuous improvement (kaizen), waste elimination,
* Conflict resolution
* Health, safety and environment (HSE) principles and requirements
* Customer care standards
* Basic financial management
* Business strategic planning
* Impact of change on individuals, groups and industries
* Government and regulatory processes
* Local and international market trends
* Product promotion standards
* Market and feasibility studies
* Government and regulatory processes
* Local and international business environment
* Relevant developments in other industries
* Regional/ County business expansion standards

**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 Sources of personal and business finance as per financial procedures and standards 2. Managed Personal finances as per financial procedures and standards 3. Made Investment decisions as per financial procedures and standards 4. GeneratedBusiness ideas and opportunities based on business procedure and standards 5. Analyzed business life cycle based on business procedure and standards 6. Determined business innovative standards as per business principles 7. Developed and presented a business plan as per regulatory framework. |
| 1. Resource Implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place |
| 1. Methods of Assessment | Competency may be assessed through:   1. Written tests 2. Oral questions 3. Third party report 4. Interviews 5. Portfolio |
| 1. Context of Assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work 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

# APPLY ORGANIC AND INORGANIC CHEMISTRY

**UNIT CODE: 0531 441 05A**

**UNIT DESCRIPTION**

This unit covers the competencies required to apply inorganic and organic chemistry, it involves applying physical chemistry principles, applying inorganic chemistry concepts, applying organic chemistry concepts

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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 physical chemistry principles | 1. Acid and bases properties are applied as per acid-base theory. 2. Salts properties are applied as per salt solubility rules 3. Ionic and chemical equilibrium properties are applied as per physical chemistry theory. 4. Reaction kinetics properties are applied as per physical chemistry theory. 5. Gas properties are applied as per Kinetic theory of gases. |
| * + - 1. Apply inorganic chemistry concepts | 1. Elements are identified and classified as per the periodic table. 2. Chemical bonds are determined as per Valence Shell Electron Pair Repulsion (VSEPR) theory. 3. Inorganic salts are tested as Per solubility rules |
| * + - 1. Apply organic chemistry concepts | 1. Organic compounds classes are used according to International Union of Pure and Applied Chemistry (IUPAC) rules. 2. Physical properties of organic compounds are applied as per IUPAC rules. 3. Chemical properties organic compounds are applied as per IUPAC rules. 4. Synthesized compounds are purified as per organic laboratory manual 5. Purified compounds are categorized as per organic laboratory manual |

**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. Cover page details includes but not limited to: | * Name of the Organization * Project Title * Project Time-frame * Project Contacts |
| 2. Summary includes but not limited to: | * Background information * Problem statement * Scope * Project Objectives * Project justification * Research questions * Project hypothesis * Significance of the study |
| 3. Methodology includes but not limited to: | * Project Approach Summary * Work Breakdown * Task Time Estimates * Project Deliverables * Research questions |
| 4. Cost includes but not limited to: | * Project Budget * Budget Narrative * Additional Financial Statements |
| 5. Plan includes but not limited to: | * Proposal development * Data collection * Time frame * Activity |
| 6. Processed includes but not limited to: | * Tabulated * Using Data processing software * Used in mathematical functions * Modelled |
| 7. Pre-processed includes but not limited to: | * Sorted * Cleaned |
| 8. Relevant stakeholders include but not limited to: | * Institution * Supervisor * Any company that helped in the research. |

**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:

* Periodic table
* Hydrocarbons
* Chemical reaction
* Laboratory apparatus
* Laboratory rules and regulation

**Required knowledge**

The individual needs to demonstrate knowledge of:

● Observation

● Analytical

● Critical thinking

● Writing

● Active listening

● Problem-solving

**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. Applied acid and bases properties as per acid-base theory. 2. Applied salts properties as per salt solubility rules 3. Applied Ionic and chemical equilibrium properties as per physical chemistry theory. 4. Formed aqueous solutions based on mole concept principles. 5. Applied reaction kinetics properties as per physical chemistry theory. 6. Applied gas properties as per kinetic theory of gasses. 7. Tested inorganic salts as per solubility rules 8. Applied physical properties of organic compounds as per IUPAC rules. 9. Applied chemical properties of organic compounds as per IUPAC rules. 10. Used purified compounds as per organic laboratory 11. manual |
| 2. Resource Implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place. 2. Access to relevant workplace. 3. Materials relevant to the proposed activity or tasks. |
| 3. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Written test 4. Portfolio of Evidence 5. Interview 6. Third party report |
| 4. Context of Assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| 5. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**PERFORM LABORATORY TECHNIQUES**

**UNIT CODE: 0711 451 06A**

**UNIT DESCRIPTION**

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

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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 Maintain laboratory safety | ***Sources of danger*** in the lab are mapped as per OSHA act 2007  ***Safety precaution measures*** are maintained as per OSHA act 2007  Lab occupational, health and safety operation policy are applied as per OSHA act 2007  laboratory Accidents are recorded as per OSHA 2007 |
| 2 Administer first aid | * + 1. first aid kit is equipped as per OSHA,2007     2. First aid is administered as per OSHA ,2007     3. first aid communication is carried out as per OSHA, 2007 |
| 3 Produce geo-maps | 1. Lab equipment are calibrated as per standard operating procedures (SOPs). 2. ***Lab equipment*** are serviced as per SOPs. 3. lab equipment are cleaned as per SOPs. |
| 4 carry out sample collection | 1. Sample collection tools are assembled as per institution’s SOPs. 2. Sample storage package is labelled as per institution’s SOPs. 3. The sample is collected as per institution’s SOPs. 4. Samples are packaged as per labels. 5. Samples ***storage*** is carried out as per institution’s SOPs. |
| 5 prepare specimen samples | 1. Specimen tools are ***preparation*** is carried out as per the sample. 2. The specimen is prepared as per laboratory SOPs. 3. The experiment using the specimen is performed as per laboratory SOPs. 4. Specimen experimental findings are recorded as per institution SOPs. |

**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. Sources of danger includes but not limited to: | * Chemical Hazards * Biological Hazards * Physical Hazards * Equipment Hazards * Fire and Explosion Risks |
| 2. Safety precaution measures includes but not limited to: | * Personal Protective Equipment (PPE) * Handling Chemicals * Equipment Safety * Fire Safety * Emergency Procedures * Chemical Storage |
| 3. Lab equipments includes but not limited to: | * Microscopes * Glassware * Heating Equipments * Analytical Instruments * Safety Equipment * pH Meters and Conductivity Meters * Centrifuges |
| 1. Storage includes but not limited to: | * Chemical Storage * Glassware Storage * Refrigeration * Waste Storage * Khaki bags * Plastic bags |
| 5 preparation includes but not limited to: | * Fixation * Processing * Embedding * Sectioning * Staining * Mounting |

**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:

* Setting up equipment
* Performing first aid
* Preparing reagents
* Housekeeping skills
* Labelling
* Producing photographs
* Keeping records
* Communication skills
* Basic ICT skills

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Organization of lab
* Lab rules and regulations
* Lab layout
* Photography
* Solutions and reagents
* First aid
* Safety precautions
* Lab equipment, tools and materials
* Lab animals and plants.
* Preservation of specimens

**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. Mapped sources of danger in the lab as per OSHA act 2007 2. Maintained safety precaution measures as per OSHA act 2007 3. Administered first aid as per OSHA ,2007 4. Cleaned lab equipment as per SOPs 5. Carried out samples’ storage as per institution’s SOPs 6. Carried out specimen tools are preparation as per the sample 7. Prepared the specimen as per laboratory SOPs |
| 2. Resource Implications | The following resources should be provided:   1. appropriately simulated environment where assessment can take place. 2. Access to a relevant workplace 3. Relevant to the proposed activity or tasks |
| 3. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Written assessment 4. Portfolio of Evidence 5. Interview 6. Third party report |
| 4. Context of Assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| 5. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# APPLY ENVIRONMENTAL PRINCIPLES

**UNIT CODE: 0521 441 07A**

**UNIT DESCRIPTION**

This unit covers the competencies required to applying environmental principles, it involves applying basic environmental principles, determining energy flow in an ecosystem, applying environmental ethics and values, applying environmental impact assessment principles, applying environmental legislations, applying environmental research techniques.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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 basic environmental principles | 1. Environmental ***components*** are monitored as per centre of biodiversity ISO 2017 2. Environmental resources are monitored as per EMCA cap 387 3. ***Genetics*** of organisms is carried out as per national biosafety regulation guidelines (mainly genetics principles of plants and animals 4. Environmental resource conflict management is implemented as per work requirements 5. ***Resource conservation plans*** are implemented as per work requirements |
| * + 1. Determine energy flow in an ecosystem | 1. ***Ecosystems*** are identified and monitored as per Centre of Biodiversity ISO 2017 2. ***Ecological interactions*** are determined as per Centre of Biodiversity ISO 2017 3. ***Bio-geochemical cycles*** are identified as per Centre of Biodiversity ISO 2017 |
| * + 1. Apply environmental ethics and values | 1. Environmental legislations on conservation are implemented as per international environmental laws 2017 2. Multilateral environmental agreements on resources are implemented as per international environmental laws 2017 3. Local ordinances on resource use are implemented as per international environmental laws 2017 4. environmental ethics on resource consumption is implemented as per international environmental laws 2017 |
| * + 1. Apply environmental impact assessment principles | 1. Designated project areas are mapped as per EMCA (Environmental Impact Assessment and Audit) Regulations, 2003 (amended 2019) 2. ***Baseline data collection tools*** are assembled as per work requirements 3. ***Baseline parameters*** are measured as per The Environmental (Impact Assessment and Audit) Regulations, 2003 4. Project ***legal and legislative framework*** is identified as per The Environmental (Impact Assessment and Audit) Regulations, 2003 5. Potential ***environmental impacts*** are identified as per The Environmental (Impact Assessment and Audit) Regulations, 2003 6. Project ***stakeholders*** are identified as per The Environmental (Impact Assessment and Audit) Regulations, 2003 7. Public participation data collection is carried out as per The Environmental (Impact Assessment and Audit) Regulations, 2003 8. Environmental ***mitigation measures*** are implemented as per The Environmental (Impact Assessment and Audit) Regulations, 2003 9. Baseline data collection tools are maintained as per work requirements. 10. Environmental outcomes are monitored as per The Environmental (Impact Assessment and Audit) Regulations, 2003 |
| * + 1. Apply environmental legislations | 1. Environmental ***legal and legislative frameworks*** are identified as per The Environmental (Impact Assessment and Audit) Regulations, 2003 2. Project environmental ***legal and legislative frameworks*** are categorized as per The Environmental (Impact Assessment and Audit) Regulations, 2003 3. Project environmental legislation's compliance is monitored as per The Environmental (Impact Assessment and Audit) Regulations, 2003 |
| * + 1. Apply environmental research techniques | 1. Environmental study areas are mapped as per EMCA CAP. 387 2. Environmental data collection tools are assembled as per work requirements 3. Environmental samples are prepared as per SOP 4. Data collection is carried out as per EMCA CAP. 387 5. Specimen findings are recorded as per institution SOPs 6. Environmental observations are documented as per institution SOPs 7. Field and laboratory data collection tools are maintained as per SOPs |

**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. Environmental componentsmay include but not limited to; | * Atmosphere * Hydrosphere * Lithosphere * Biosphere |
| 2. Environmental resourcesmay include but not limited to; | * Water * Air * Soil * Biodiversity * Forests * Minerals * Wildlife |
| 3. Environmental resource conflict managementmay include but not limited to; | * Negotiation * Mediation * Collaborative management * Legal frameworks and enforcement * Capacity building |
| 4. Resource conservation plansmay include but not limited to; | * Biodiversity conservation * Water resource management * Forestry conservation * Energy conservation and efficiency * Climate change mitigation and adaptation * Waste management * Land use planning |
| 5. Ecosystemsmay include but not limited to; | * Regulatory * Supportive * Provision * Cultural |
| 6. Ecological interactions may include but not limited to; | * Predation * Competition * Mutualism * Parasitism * Amensalism |
| 7. Bio-geochemical cyclesmay include but not limited to; | * Water cycle * Carbon cycle * Nitrogen cycle * Oxygen cycle * Phosphorus cycle * Sulfur cycle |
| 9. Environmental legislationsmay include but not limited to; | * Environmental Management and Co-ordination Act * Environmental (Impact Assessment and Audit) Regulations, 2003 * EMCA (Waste management) Regulations, 2006 * EMC (Waste Management) Regulation 2006 * E-Waste Management in Kenya, 2010 * The Environmental Management And Coordination (Noise And Excessive Vibration Pollution) (Control) Regulations, 2009 |
| 10. Multilateral environmental agreementsmay include but not limited to; | * United Nations Framework Convention on Climate Change * Paris Agreement on climate change * Convention on Biological Diversity * Kyoto Protocol * Montreal Protocol * Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes |
| 11. Local ordinancesmay include but not limited to; | * Noise ordinances * Land use zoning * Waste management * Air quality * Protected species and habitats |
| 12. Environmental ethics may include but not limited to; | * Anthropocentrism * Ecocentrism * Sustainability * Justice * Intrinsic value of nature |
| 13. Baseline data collection toolsmay include but not limited to; | * Questionnaires * Interviews * Field surveys * Photographic documentation (Cameras) * GPS devices * Sound level meters (noise dosimeters) * Google earth * Portable VOC Monitors * Turbidimeters |
| 14. Baseline parameters may include but not limited to; | * Air quality * Water quality * Soil quality * Biodiversity * Noise levels * Land use and land cover * Cultural and socio-economic factors * Climatic conditions * Hydrology and hydrogeology * Geology * Waste management |
| 15. Legal and legislative frameworkmay include but not limited to; | * National Policy Framework 2014 * Vision 2030 * The Constitution of Kenya, 2010 * EMCA cap 387 * Occupational Health and Safety Act No.15 of 2007 * The Public Health Act CAP 242 * The County Government Act 2012 * The Physical and Land Use Planning Act, 2019 * Building code * E-Waste Management in Kenya, 2010 |
| 16. Environmental impacts may include but not limited to; | * Air pollution * Land pollution * Water pollution * Social degradation * Deforestation * Water consumption * Wastes generation * Health and safety * Economic loss * Biodiversity loss |
| 17. Stakeholdersmay include but not limited to; | * Proponent * State actors * Community * Non-state actors |
| 18. Mitigation measures may include but not limited to; | * Avoidance * Minimization * Alternatives * Compensatory mitigation |
| 19. Environmental data collection tools may include but not limited to; | * Questionnaires * Interviews * Field surveys * Sampling equipment * pH meters * Temperature probes * Moisture meters * Air quality monitors * Camera traps |
| 20. Environmental observationsmay include but not limited to; | * Naturalistic observation * Participation observation * Structured observation * Time series observations * Land use and land cover observation |
| 21. Field and laboratory data collection toolsmay include but not limited to; | * Spectrophotometer * Gas chromatograph * Mass spectrometer * pH meter * GPS devices * Soil sampling kits * Quadrats * Transect tapes |

**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:

* Environmental sustainability
* Basic analytical skills
* Skills in negotiation, mediation, and collaboration
* Communication skills
* Adaptability and resilience
* Flexibility
* Observation skills
* Problem solving
* Surveying skills
* Interviewing skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Sustainable development
* Ecology
* Climate change
* Environmental policies and laws
* Ecosystem services
* Safety protocols
* Waste management
* Environmental ethics
* Interdisciplinary approach
* Compliance and reporting
* Natural resources management
* Ecological interactions
* Environmental pollution control

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Carried out Genetics of organisms as per national biosafety regulation guidelines (mainly genetics principles of plants and animals) 2. Implemented environmental resource conflict management as per work requirements 3. Implemented resource conservation plans as per work requirements 4. Determined ecological interactions were as per centre of biodiversity ISO 2017 5. Implemented environmental legislations on conservation were as per international environmental laws 2017 6. Implemented multilateral environmental agreements on resources were as per international environmental laws 2017 7. Conducted environmental impact assessment was as per (Environmental Impact Assessment and Audit) Regulations,2003 (amended 2019) 8. Carried out environmental research techniques 9. as per EMCA CAP. 387 |
| Resource Implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or tasks |
| 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-play |
| Context of Assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# APPLY NATURAL RESOURCE ECONOMICS

**UNIT CODE: 0521 441 08A**

**UNIT DESCRIPTION**

This unit covers the competencies required to apply natural resource economics, it involves applying economics principles of natural resource, determining commodity prices, interpreting production function curves, applying tragedy of the commons, applying sustainable development goals.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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 economics  principles of natural resource | 1. Resources are categorized based on types of natural resources identified as per the State of Environment Report 2019-2021. 2. Data collection tools are assembled as per work procedures 3. Natural economic resource data is managed as per work procedures 4. ***Economic criteria*** for natural resource utilization is monitored as per work procedures 5. ***Command and control standards*** are implemented as per standards of economics |
| 2. Determine commodity prices | 1. Natural resource ***prices are obtained***  from the market as per Kenya National Bureau of Statistics (KNBS) 2. ***Allocate resource*** prices are implemented as per work procedure 3. Property right approaches are implemented based on National land policy 4. ***Market failure*** is monitored based on market demand |
| 3. interpret production  function curves | 1. Demand and supply is analyzed based on law of supply and demand 2. Natural resource 3. ***Production decisions*** are made based on market demand 4. ***Production relationship*** is identified based on input and output performance in an agricultural enterprise 5. ***Principles of production function*** are applied based on nature of agricultural enterprise |
| 4. Apply tragedy of the commons | 1. Environmental common resources are identified as per work procedures 2. Environmental common resources' utilization are assessed as per the work procedures. 3. Environmental common resources utilization threats are determined as per work procedures. 4. Environmental common resource's utilization model is applied as per work procedures. |
| 5.Apply sustainable development goals | 1. Environmental resources are identified as per work procedures Environmental resource's utilization are assessed as per the work procedures. 2. Environmental resources utilization threats are determined as per work procedures. 3. Sustainable Development Goals (SDGs) models are identified as per Agenda 21. 4. SDG models are applied as per the Agenda 21 |

**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. Economic criteria includes but not limited to: | * Cost-Benefit Analysis * Return on Investment * Net Present Value * Internal Rate of Return * Cost-Effectiveness Analysis * Economic Impact Analysis |
| 2. Command and control standards includes but not limited to: | * Emission Standards * Effluent Standards * Waste Management Standards * Compliance and Enforcement * Land Use Planning and Zoning |
| 3. prices are obtained includes but not limited to: | * Commodity Exchanges Spot Prices * Futures and Options Markets * Government Agencies and Publications * Industry Reports and Market Analysis * Global Economic Conditions and Geopolitical Events |
| 4. Allocate resource, includes but not limited to: | * ·Market-Based Allocation * Regulatory Allocation * Public Ownership and Management * Private Ownership and Property Rights * Community-Based Resource Management * International Cooperation and Agreements |
| 5. Market failure includes but not limited to | * Externalities * Public Goods * Market Power and Monopoly * Asymmetric Information * Natural Monopolies |
| 6. Production decisions includes but not limited to | * Production Planning * Resource Allocation * Production Methods and Techniques * Cost Considerations * Market Demand and Customer Preferences |
| 7.Production relationship includes but not limited to | * Production Function * Marginal Product of Labor * Economies of Scale and Diseconomies of Scale * Isoquants and Isocost Lines * Law of Diminishing Marginal Return |
| 8 Principles of production function include but not limited to | * Input-Output Relationship * Marginal Productivity * Law of Diminishing Marginal Returns * Isoquants and Isocost Lines |
| 9 Sustainable Development Goals (SDGs) models includes but not limited to | * Integrated SDG Frameworks * Mapping and Alignment Tools * Systems Thinking and Complexity Approaches * Multi-Stakeholder Collaboration |

**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:

* Negotiation skills
* Quantitative skills
* Analytical skills
* Math and economic skills
* ICT skills
* Research skills
* Analysis skills

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Mathematics
* Policies and regulations
* Externalities
* Profit and loss
* Cost benefit analysis
* Elasticity demand and supply
* Taxes
* Market failure
* Market and non-market goods and services
* Public goods

**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. Categorized resources based on types of natural resources identified as per the State of Environment Report 2019-2021. 2. Monitored ***economic criteria*** for natural resource utilization as per work procedures 3. Monitored ***economic criteria*** for natural resource utilization as per work procedures 4. ***Command and control standards*** are implemented as per standards of economics 5. ***Obtained*** Natural resource ***prices*** from the market as per Kenya National Bureau of Statistics (KNBS) 6. Analysed demand and supply are based on law of supply and demand of natural resources |
| * + 1. Resource Implications | The following resources should be provided:   1. appropriately simulated environment where assessment can take place 2. Access to relevant workplace 3. Materials relevant to the proposed activity or tasks |
| * + 1. Methods of Assessment | Competency in this unit may be assessed through**:**   1. Observation 2. Demonstration 3. Written test 4. Portfolio of Evidence 5. Interview 6. Third party report |
| * + 1. Context of Assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| * + 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**CORE UNITS OF COMPETENCY**

# MONITOR ENVIRONMENTAL POLLUTION

**UNIT CODE: 0521 451 09A**

**UNIT DESCRIPTION**

This unit specifies the competencies required to monitor environmental pollution. It involves assessing air quality, monitoring water quality, monitoring soil quality, monitoring noise pollution and creating environmental pollution awareness

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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. Assess air quality | 1. ***Air quality determination tools*** are assembled as per EMCA, (Air quality regulations) 2014 2. ***Air quality emission*** ***measurements*** are recorded asper EMCA Air quality regulations) 2014 3. Air pollution emissions are monitored as per EMCA, (Air quality regulations) 2014 |
| 2. Monitor water quality | 1. Point and Non-point pollution sources are mapped as per EMCA (water quality) regulations, 2006 2. Water quality sampling tools are assembled as per work procedures 3. Water quality sampling is carried out as per work procedures 4. ***Water quality measurements*** are carried out as per work procedures. |
| 3. Monitor soil quality | 1. Soil sampling sites are mapped as per work procedures 2. Soil sampling tools are assembled as per work requirements. 3. Soil sample is collected as per work procedures 4. ***Soil quality sampling recommendations*** are implemented as per work procedures |
| 4. Monitor noise  pollution | 1. ***Noise pollution* sources** are mapped based on EMCA (noise pollution and excessive vibration)regulations 2009 2. ***Noise pollution levels*** are measured based EMCA (noise pollution and excessive vibration)regulations 2009 3. ***Noise pollution control recommendations*** areimplemented as per EMCA (noise pollution and excessive vibration) regulations 2009 4. Noise pollution levels routine inspection is carried out as per work procedure. |
| 5. Conduct environmental pollution awareness | 1. Environmental pollution emission sources are mapped as per EMCA Cap 387 2. Environmental pollution awareness data collection is carried out as per work procedures 3. Environmental pollution awareness is carried out as per work procedures 4. Environmental pollution control measures are monitored as per EMCA Cap 387. |

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**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| Sources of air pollution include but not limited to: | * Industrial * Anthropogenic |
| Air quality determination tools includes but not limited to: | * Aerosol photometer * Velocity meter. * Specialized Landfill Gas(LFG)systems * Multi gas monitors/Single Gas monitors * Gas Chromatogram * Wireless gas detector * Photo ionization detectors * Mercury vapour analyzer * High vacuum air samplers |
| Air quality emission measurements includes but not limited to: | * Ground level Ozone * Carbon (IV) Oxide * Carbon monoxide * Sulphur (IV) oxide * Nitrogen dioxide * Particulates * Ammonia * Methane * Chlorofluorocarbons * Volatile organic compounds(VOC) * Hydrocarbons * Hydrogen sulphide * Dioxins and furans |
| Water quality measurements include but not limited to: | * Biological Oxygen demand(BOD) * Chemical Oxygen demand(COD) * Conductivity * Total dissolved solids(TDS) * Turbidity * Dissolved Oxygen (DO) * pH * Salinity * Temperature * Total Suspended solids(TSS) * Total colifom |
| Soil quality sampling recommendations includes but not limited to: | * Mulching * Cover crops * Conservation tillage * Grassed waterways * Integrated pest management * Crop rotation * Contour farming * Strip cropping * Carbon farming * Agroforestry * permaculture * Biodynamic farming |
| Air pollution control measures includes but not limited to | * Green energy technologies   + Solar   + Wind   + Geothermal * Carbon sinks * Environmental plans and regulations |
| Water pollution control measures includes but not limited to: | * Water quality permits * Soil erosion control * Biological pest control techniques * Wastewater treatment * Regulation of effluents |
| Noise pollution sources includes but not limited to: | * Radio, TV, other sound amplifying devices * Parties and social events * Hawkers, peddlers, touts, street preachers * Machinery * Noise from motor vehicles * Construction at night * Noise, excessive vibrations from construction, demolition, mining or quarrying sites. * Environmental Impact Assessment |
| Noise pollution levels includes but not limited to: | * Silent Zone 40dBA * Places of worship 40 dBA * Residential : Indoor 45 dBA * Residential Outdoor 50 dBA * Mixed residential * (with some, commercial and places of entertainment) 55 dBA * E. Commercial 60 dBA |
| Treated includes but not limited to: | * Extraction and separation techniques * Thermal methods * Chemical methods * Microbial treatment methods |
| Sources of noise pollution include but not limited to: | * Night clubs * Industries * Vehicles |
| Noise pollution control measures includes but not limited to: | * Noise permits * Ear muffs are used in high noise areas * Industries are constructed away from residential areas * Closure notices * penalties * tree planting |

**REQUIRED KNOWLEDGE AND SKILLS**

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

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Types of pollutants
* Sources of pollution
* Permits
* Methods of pollution control
* Environmental laws, policies and regulations
* Pollution monitoring and evaluation tools
* Environmental degradation and pollution
* Safety precautions.
* Sustainable development goals

**Required skills**

The individual needs to demonstrate the following skills:

* Monitoring and evaluation
* sampling skills
* Recording skills
* Measuring skills
* Observation skills
* Problem-solving skills
* Sorting/Segregation wastes

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1.Critical aspects of Competency | assessment requires evidence that the candidate:   * 1. Recorded ***air quality emission*** ***measurements*** asper EMCA Air quality regulations) 2014   2. Mapped point and Non-point pollution sources as per EMCA (water quality) regulations, 2006   3. Carried out water quality sampling as per work procedures   4. Carried out ***water quality measurements*** as per work procedures.   5. Collected soil sample as per work procedures   6. Implemented ***soil quality sampling recommendations*** as per work procedures   7. Measured ***noise pollution levels***  based EMCA (noise pollution and excessive vibration)regulations 2009   8. Carried out environmental pollution awareness as per work procedures |
| 2.Resource Implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or tasks |
| 3. Methods of Assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Written assessments 4. Portfolio of Evidence 5. Interview 6. Third party report 7. Practical demonstrations |
| 4.Context of Assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| 5. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

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# PERFORM ENVIRONMENTAL WASTE MANAGEMENT

**UNIT CODE: 0521 451 10A**

**UNIT DESCRIPTION**

This unit covers the competencies required to perform environmental waste management. It involves performing environmental waste segregation, performing environmental waste collection, performing environmental waste transportation, carrying out environmental waste treatment, carrying out environmental waste disposal and creating environmental waste management awareness

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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. Perform environmental waste collection | 1. Waste collection points are mapped as per sustainable waste management Act of 2022 (SWMA) 2. Waste collection bins are installed as per SWMA 2022 3. Waste is collected as per SWMA 2022 4. Waste collection is monitored as per SWMA 2022 |
| * + 1. Perform environmental waste segregation | 1. ***Waste sources*** aremapped as per Sustainable waste management Act, 2022 2. ***Waste***  ***storage facilities coding*** is carried outas per the Sustainable waste management Act 2022 3. ***Waste segregation*** is carried outas per Sustainable waste management Act 2022 |
| 3. Perform environmental waste transportation | 1. ***Waste collection points*** are designated as per the work procedures 2. Waste transportation facilities are assembled as per SWMA 2022 3. Waste is transportedas per SWMA 2022 4. Waste transportation monitoring is done as per SWMA 2022 |
| 4. Carryout environmental waste treatment | 1. ***Waste treatment sites mapping*** is carried out as per SWMA 2022 2. ***Waste treatment is*** carried out as per SWMA 2022 3. Waste treatment facility is monitored as per SWMA 2022 |
| 5. Carry out environmental waste disposal | 1. Waste disposal site is mapped as per SWMA 2022 2. *Waste* *disposal sites* are segmented as per SWMA 2022 3. Waste is disposed as per SWMA 2022 4. Waste disposal activities are monitored as per SWMA 2022 |
| 6. Create environmental waste management awareness | 1. ***Waste generation areas*** are mapped as per work requirements 2. ***Waste management data collection*** iscarried outas per work requirement. 3. Waste management awareness activities are carried as per waste management recommendation. 4. Waste management activities are monitored as per SWMA 2022 |

**RANGE**

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

|  |  |
| --- | --- |
| Variable | Range |
| Waste sources may include, but are not limited to: | * Commercial premises * Hospitals * Pharmaceutical * Agricultural areas * Industries * Factories * Households * Municipal waste sources * Electronic waste sources * Construction activities * Demolition areas |
| Waste storage facilities coding may include, but are not limited to: | * Brown: Chemicals and pharmaceuticals waste * Yellow/Black: Radioactive waste * Yellow: Sharps * Black: Non-infectious * Red: Highly infectious |
| Waste segregation may include, but are not limited to: | * Recyclable waste * Infectious waste * Biodegradable waste * Non-biodegradable * Hazardous * E-waste * Organic waste |
| Waste collection points may include, but are not limited to: | * Residential areas * Commercial areas(CBD) * Municipal markets * Disaster preparedness * Medical facilities * Industrial areas * Public spaces * Waste storage bins |
| Waste transportation facilities may include, but are not limited to: | * Dump trucks and trailers * Landfill tippers * Walking floor trailers * Bulk Pneumatic tanker * Skip trucks * Waste compactor |
| Waste transportation monitoring may include but are not limited to: | * Spillage * Efficiency of transporting facilities * Effectiveness of transportation facility * Health and Safety risks |
| Waste treatment sites mapping may include but are not limited to | * Accessibility * Safety measures * Coverage |
| Waste treatment may include, but are not limited to: | * Disinfection * Thermal treatment * stabilization ponds * liquid waste convection * Recycling/Composting * Bioremediation * Bio-treatment |
| Waste disposal sites are segmented may include but are not limited to | * Rotation dumping * segmentation as per waste types |
| Waste disposal activities monitoring may include, but are not limited to: | * Inlet-outlet checks * Weighbridge management * Passages management * Monitor leachates * Monitor seepage * Awareness creation * Security checks * Enforcement |
| Waste generation areas may include, but are not limited to: | * Residential areas * Commercial areas(CBD) * Municipal markets * Disaster preparedness * Medical facilities * Industrial areas * Public spaces * Waste storage bins |
| Waste management data collection may include but are not limited to: | * Structured Questionnaires * Interviews * Observation checklists * Focused discussion groups * Media reports * Photographic recorders |

**REQUIRED KNOWLEDGE AND SKILLS**

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

* Types of waste
* Waste segregation
* Waste collection
* Waste transportation
* Waste treatment
* Waste disposal
* Waste management monitoring

**Required Skills**

The individual needs to demonstrate the following skills:

* Mapping skills
* Data Collection skills
* Observation Skills
* Survey skills
* Monitoring Skills
* Creative and innovative
* basic ICT skills
* Problem-solving skills
* Assessing skills
* Resource mobilization
* Interpretation skills

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   1. Carried out ***waste storage facilities coding*** as per the Sustainable waste management Act 2022. 2. Carried out ***waste segregation*** as per Sustainable waste management Act 2022. 3. Collected Waste as per SWMA 2022 4. Assembled ***waste transportation facilities***  are as per SWMA 2022 5. Transported waste as per SWMA 2022 6. Carried out ***waste treatment***  as per SWMA 2022 7. Segmented *waste* *disposal sites* as per SWMA 2022 8. Disposed waste as per SWMA 2022 9. Monitored waste disposal activities as per SWMA 2022 |
| 2.Resource implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or tasks |
| 3.Methods of assessment | Competency in this unit may be assessed through:   1. Observation 2. Oral questioning 3. Written test 4. Portfolio of Evidence 5. Interview 6. Third party report |
| 4.Context of assessment | Competency may be assessed:   1. Workplace 2. Simulated work environment |
| 5.Guidance information for assessment | Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |

# PERFORM ENVIRONMENTAL HEALTH AND SAFETY PRACTICES

**UNIT CODE: 0521 451 11A**

**UNIT DESCRIPTION**

This unit covers the competencies required to perform Environmental health and safety practices it involves performing hazard identification, assessing environmental health and safety risks, managing environmental health and safety risks and creating environmental health and safety awareness.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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. Perform hazard identification | 1. Potential environmental health and safety hazards are identified as per EMCA Cap 387 2. Potential Environmental health and safety hazards are categorized as per EMCA Cap 387 3. Environmental health and safety hazards are prioritized as per EMCA Cap 387 |
| * + - 1. assess environmental health and safety risks | 1. Environmental health and safety risks are identified based on EMCA Cap 387. 2. Environmental health and safety risks are prioritized as per EMCA Cap 387. 3. ***Environmental health and safety risks*** are evaluated as per Occupational Health and Safety Act, 2007. 4. ***Environmental health and safety risks precaution decisions*** are carried out as per Occupational Health and Safety Act, 2007. |
| * + - 1. Manage environmental health and safety risks | 1. Environmental hazard ***Hierarchy of controls*** is implemented as per EMCA 387 2. Environmental Protection measures are mobilized as per work requirements. 3. Environmental Health and Safety Policies are implemented as per work procedures. 4. ***Environmental health and safety risk emergency response measure***s are implemented as per EMCA CAP 387; Work Injury Benefit Act, 2007. |
| * + - 1. Create environmental health and Safety Awareness | 1. Environmental health and safety committee is constituted as per EMCA Cap 387 OSHA,2007 2. Environmental hazards and risks exposure data is determined as per work procedures 3. Environmental health and safety awareness is carried out as per work procedures. |

**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. Environmental health and safety risks may include, but are not limited to: | * Chemical Hazards * Physical Hazards * Air Quality Hazard * Water Quality Hazards * Fire and Explosion Hazard * Climate-Related Hazards |
| 1. Environmental health and safety risks precaution decisions may include but are not limited to | * Risk Assessment * Precautionary Decisions * Continuous Monitoring and Improvement * Regulatory Compliance * Documentation and Record-Keeping |
| 1. Hierarchy of controls may include but are not limited to | * Elimination/Substitution * Engineering Controls * Administrative Controls * Personal Protective Equipment |
| 1. Environmental health and safety risk emergency response measures may include but are not limited to | * Identify Potential Risks * Develop Emergency Response Plans * Training and Education * Emergency Communication * Fire Safety and Evacuation |
| 1. Environmental health and safety awareness may include but are not limited to | * Safety Protocols and Procedures * Training and Education * Compliance with Regulations * Environmental Awareness * Continuous Improvement |

**REQUIRED KNOWLEDGE AND SKILLS**

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

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Environmental hazards identification
* Environmental health and safety risks evaluation
* Control and mitigation of environmental hazards
* Types of PPEs
* Correct use of PPEs

**Required skills**

The individual needs to demonstrate the following skills:

* Analytical
* Problem solving
* Planning
* Monitoring
* Evaluation
* Negotiation
* Interpersonal
* Conflict resolution
* Communication
* Presentation
* Numeracy
* Observation
* Negotiation
* Digital literacy
* Equipment calibration

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| * + 1. Critical aspects of competency | Assessment requires evidence that the candidate:   1. Prioritized environmental health and safety hazards as per EMCA Cap 387 2. Evaluated environmental health and safety risks as per Occupational Health and Safety Act, 2007. 3. Carried out environmental health and safety risks precaution decisions as per Occupational Health and Safety Act, 2007. 4. Implemented environmental hazard Hierarchy of controls as per EMCA 387 5. Implemented environmental Health and Safety Policies were as per work procedures. 6. Carried out environmental health and safety awareness 7. as per work procedures. |
| * + 1. Resource implications | The following resources should be provided:   1. appropriately simulated environment where assessment can take place 2. Access to a relevant workplace 3. Relevant to the proposed activity or tasks |
| Methods of assessment | Competency in this unit may be assessed through:   1. Observation 2. Written assessment 3. Portfolio of Evidence 4. Interview 5. Third party report |
| Context of assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| Guidance information for assessment | Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |

# 

**PERFORM ENVIRONMENTAL ECOLOGY MAINTENANCE**

**UNIT CODE: 0521 451 12A**

**UNIT DESCRIPTION**

This unit covers the competencies required to perform environmental ecology maintenance, it involves carrying out biological resource inventory, performing plant propagation, maintaining ecological wildlife sanctuary and performing ecological restoration.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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. Carry out biological resource inventory | 1. ***Mapping of resources*** for ***inventory*** is carried outas per environmental management and coordination act (EMCA) (conservation of biological diversity) regulation 2016. 2. Inventory data collection tools are assembled as per work guidelines. 3. ***Field data collection is*** carried out ***as*** per the field SOPs. 4. The inventory is updated as per data collected. |
| 2. Perform plant propagation | 1. Plant species to be propagated are mapped as per work requirement. 2. Plant propagation tools are assembled as per the work requirements. 3. ***Plant propagation*** is conducted as per institution Agroforestry guidelines 2019. 4. ***Plant growth monitoring*** is done as per work requirements. |
| 3. Maintain ecological wildlife sanctuary | 1. Sanctuary wildlife are mapped as per work requirements. 2. Data collection tools are assembled as per work requirements. 3. Data collectionis conducted as per the work requirements. 4. ***Wildlife sanctuary ecosystems*** are maintained ***as*** per Management plan guidelines,2016. |
| 4. Perform ecological restoration | 1. Degraded ecology is mapped as per SOPs. 2. Ecological ***restoration tools*** are assembled as per work guidelines. 3. Ecological restoration is Conducted as per degraded rehabilitated water ecosystem guidelines, 2017, Rehabilitating. 4. Ecological restoration progress monitored as per work requirements. |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Mapping of resources for inventory may include but not limited to; | * Species distribution mapping * Habitat mapping * Wildlife corridor mapping * Biodiversity hotspots mapping |
| 1. Field data collection may include but not limited to; | * Questionnaires * Interviews * Transect surveys * Quadrat sampling * Netting and trapping * Camera trapping |
| 1. Plant mapped may include but not limited to; | * Plot-based surveys * Transect surveys * Point-centered quarter * Vegetation sampling * Species identification |
| 1. Plant propagation may include but not limited to; | * Grafting propagation * Seed propagation * Cutting propagation * Division propagation * Layering propagation * Bulb propagation * Sucker propagation |
| 1. Plant growth monitoring may include but not limited to; | * Visual observation * Taking measurements * Time-lapse photography * Leaf area index |
| 1. Wildlife sanctuary ecosystems may include but not limited to; | * Tropical rainforest sanctuary ecosystems * Temperate forest sanctuary ecosystems * Desert sanctuary ecosystems * Grassland sanctuary ecosystems * Wetland sanctuary ecosystems |
| 1. Restoration tools may include but not limited to; | * Hand trowels * Dibbles * Seed spreaders * Wheelbarrow * Auger |

**REQUIRED KNOWLEDGE AND SKILLS**

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

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Environmental resources
* Wildlife sanctuary ecosystems
* Resource inventory
* Plant growth
* Ecological restoration
* Grafting methods
* Sanctuary Ecosystem
* Plant growth monitoring
* Sampling skills
* Surveying skills
* Mapping Skills

**Required skills**

The individual needs to demonstrate the following skills:

* Monitoring and evaluation
* Data collection
* Observation Skills
* Measuring skills
* Reporting skills
* Problem-solving skills
* Propagation skills
* Sampling skills

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| * + - 1. Critical aspects of competency | Assessment requires evidence that the candidate:   1. Carried out Mapping of resources for inventory as per environmental 2. management and coordination act (EMCA) (conservation of biological 3. diversity) regulation 2016 4. Carried out ***Field data collection as*** per the field SOPs 5. The inventory is updated as per data collected. 6. Conducted ***Plant propagation*** as per institution Agroforestry guidelines 2019 7. Maintained ***wildlife sanctuary ecosystems*** a**s** per Management plan guidelines,2016 8. Maintained ***wildlife sanctuary ecosystems*** ***as*** per Management plan guidelines,2016 9. Conducted ecological restoration as per degraded Rehabilitated water ecosystem guidelines, 2017, Rehabilitating |
| * + - 1. Resource implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or tasks |
| * + - 1. Methods of assessment | Competency in this unit may be assessed through:   1. Practical demonstrations 2. Oral questioning 3. Written test 4. Portfolio of Evidence 5. Interview 6. Third party report |
| * + - 1. Context of assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| * + - 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |

# MONITOR CLIMATE CHANGE

**UNIT CODE: 0521 451 13A**

**UNIT DESCRIPTION**

This unit covers the competencies required to monitor climate impact assessment. It involves carrying out weather data collection, monitoring greenhouse gas emissions and creating awareness on climate change.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| ELEMENT  These describe the key outcomes which make up workplace functions | 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.Carryout weather data collection | 1. ***Weather Forecasting instruments*** are assembled as per work requirement 2. Weather Forecasting instrumentsare installed as per national framework for climate service 2023 (NFCS) 3. Weather patterns are recorded as per NFCS 2023 4. Weather forecasting instruments are maintained as per work requirements. |
| 2.Monitor greenhouse gas emissions | 1. ***Greenhouse gas determination tools*** are assembled as per Climate Change (Amendment) Act, 2023; Kyoto Protocol 2. ***Greenhouse gas emission*** ***measurements*** are carried out asper The Climate Change (Amendment) Act, 2023;Kyoto Protocol 3. Greenhouse gas emission measurements are recorded asper The Climate Change (Amendment) Act, 2023 4. Greenhouse gas emission reduction awareness is carried out as per work guidelines. 5. Greenhouse gas emission is monitored as per Climate Change (Amendment) Act, 2023 |
| 3.Create awareness on climate change | 1. Climate change awareness data collection is carried out as per work procedures 2. Climate change awareness is carried out as per work procedures 3. ***climate change intervention measures***  are carried out as per work procedures |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| Weather Forecasting instruments may include but not limited to: | * Sechi disc * Rain gauge * Wind vane * Hygrometer * Anemometer * Windsock * Lightning detector * Thermometer |
| Greenhouse gases may include are not limited to: | * Carbon dioxide * Methane * Nitrous oxide * Fluorinated gases * Water vapor |
| Greenhouse gas determination tools may include, but are not limited to: | * TDLAS technology monitors * Differential Optical Absorption Spectroscopy (DOAS) * Infrared Gas Analyzer(IRGA) * Photoacoustic Spectroscopy(PAS) * Cavity Ring-Down Spectroscopy(CRDS) * Gas Chromatographs(GC) * Varied Gas Analyzers * Gas Chromatographs and Mass Spectroscopy(GC-MS) |
| Greenhouse gas emission measurements may include but are not limited to | * Device independent method * Sampling devices * biochemical reactions |
| Climate change intervention measures may include, but are not limited to: | * Promoting green energy * Afforestation and Reforestation * Sustainable agriculture * improved public transport * Waste management practices * Promote green technology * Carbon pricing * Education and awareness |

**REQUIRED KNOWLEDGE AND SKILLS**

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

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Greenhouse gas emissions
* greenhouse gas measurements tools
* Greenhouse gas measurements
* Climate Change intervention measures
* Weather forecasting
* weather forecasting instruments

**Required skills**

The individual needs to demonstrate the following skills:

* Performing installation
* Data recording skills
* Monitoring skills
* Measurement skills
* Observation skills
* Report skills
* Interpersonal skills
* Presentation skills

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1.Critical aspects of competency | Assessment requires evidence that the candidate:   * 1. Assembled ***weather Forecasting instruments*** are as per work requirement   2. Recorded weather patterns as per NFCS 2023   3. Carried out ***greenhouse gas emission*** ***measurements*** asper The Climate Change (Amendment) Act,   4. Carried out greenhouse gas emission reduction awareness as per work guidelines.   5. Monitored greenhouse gas emission as per Climate Change (Amendment) Act, 2023   6. Carried out climate change awareness as per work procedures   7. Carried out ***climate change intervention measures***  as per work procedures |
| 2.Resource implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or tasks |
| 3.Methods of assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral questioning   3. Written Assessments   4. Portfolio of Evidence   5. Interview   6. Third party report   7. presentation   8. Practical assessment |
| 4.Context of assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| 5.Guidance information for assessment | Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |

# MONITOR NATURAL RESOURCES

**UNIT CODE: 0521 451 14A**

**UNIT DESCRIPTION**

This unit covers the competencies required to monitor natural resources; it involves carrying out environmental landscaping techniques, carrying out environmental trail management, maintaining forestry resources, performing wildlife management, performing range land management and performing water resource stewardship.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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. Carry out environmental landscaping techniques | * 1. ***Designated landscaping area***s are mapped as per work procedures.   2. ***Landscaping tools*** are assembled as per work requirements   3. ***Landscaping*** is carried out as per integrated national land use guidelines, 2011   4. Landscaped areas are maintained as per work requirement |
| * + 1. Carry out environmental trail management | 1. Environmental sensitive ***ecosystems*** aremapped as per work requirements 2. Ecological trails areas are mapped as per work requirements. 3. Ecological trails are created as per work procedures 4. Ecological trails are maintained as per the work requirements. |
| 3. Maintain forestry resources | * 1. ***Forest resources*** are applied as per Forest conservation and management Act, 2016.   2. ***Data collection tool***s are assembled as per work requirements   3. ***Forest resources inventory*** is carried out as per work requirements   4. Forest resources inventory recommendations are implemented as per work procedures   5. Forest resources are monitored as per forest Act 2016 |
| 4. Perform wildlife management | 1. Wildlife resources are mapped as per the Wildlife (conservation and management) Act, 2013 2. ***Wildlife Inventory*** is carried out as per management planning guidelines 2016 3. ***Wildlife Inventory recommendations*** are carried out as per work procedures 4. ***Wildlife*** ***resources***  are monitored as per work procedures |
| 5. perform range land management | 1. Rangeland resources are mapped as per rangeland management strategy 2021-2031 2. ***Data collection tool***s are assembled as per work requirements 3. ***Rangeland Inventory resources*** are carried out as per work procedures 4. ***Rangeland inventory recommendations*** are implemented as per work procedures 5. Rangeland resources are monitored as per work procedures |
| 6. Perform water resource stewardship | 1. Water resources are mapped as per Water Act, 2016 2. Water resources are monitored as per water Act 2016 3. Water qualityis sampled as per EMCA (water quality) regulations,2006 4. Water resource conservation is implemented as per Water Act,2016 5. Water conservation awareness is created as per Water Act, 2016 |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Designated landscaping areas includes but not limited to: | * Parks and arboretums * Recreational areas * Road reserves * Riparian areas * River banks * Private spaces * Public spaces * Water catchment areas * Ecotourism sites * Gardens |
| 1. Landscaping tools includes but not limited to: | * Shovel * Rakes * Pruning Shear * Lawn mower * Grass trimmer * Hedge trimmer * Leaf blower * Lawn aerator * Wheelbarrow * Laser levels * Slope meters * Inclinometer |
| 1. Landscaping includes but not limited to: | * Artificial landscaping * Nature based landscaping |
| 1. Sensitive ecosystems includes but not limited to: | * National Parks/Reserves and arboretums * Islands * Riparian areas * River banks * Water catchment areas * Ecotourism sites * Gardens * Lakes * Rivers |
| 1. Forest resources includes but not limited to | * Trees * Shrubs * Grass * Animals * Water * Timber/wood * Fruits * Herbs * Soil |
| 1. Data collection tools includes but not limited to: | * Structured Questionnaires * Interviews * Observation checklists * Focused discussion groups * Media reports * Photographic recorder * GPS devices |
| 1. Forest resources inventory includes but not limited to: | * Plant morphology * Animal morphology * Invasive species * Native species * Endangered species * Water catchment * Soil |
| 1. Forest resources inventory recommendations includes but not limited to: | * Species enrichment * Ecosystem protection * Surveillance |
| 9. Wildlife Inventory includes but not limited to: | * Fauna species * Flora species * Water catchment areas |
| 10. Wildlife Inventory recommendations includes but not limited to: | * Species enrichment * Ecosystem protection * Surveillance |
| 11. Wildlife resources include but not limited to: | * Trees * Shrubs * Grass * Wild animals * Water * Fruits * Herbs * Soil * Birds |
| 12. Rangeland Inventory resources includes but not limited to: | * Trees * Shrubs * Grass * Animals * Birds * Water * Timber/wood * Fruits * Herbs * Soil |
| 13. Rangeland inventory recommendations includes but not limited to: | * Species enrichment * Ecosystem protection and conservation * Surveillance |

**REQUIRED KNOWLEDGE AND SKILLS**

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

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Data collection
* Forest resources
* Wildlife resources
* Rangeland resources
* Natural resource inventories
* Ecosystem Protection
* Species Enrichment
* Plant and Animal morphology
* Environmental resources
* Budgeting

**Required skills**

The individual needs to demonstrate the following skills:

* Monitoring and evaluation
* Reporting
* Measurement skills
* Sampling
* Record keeping
* Planning and organizing
* Leadership skills
* Management skills
* Basic analytical skills
* Interpersonal skills

**EVIDENCE GUIDE**

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

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| * + 1. Critical aspects of Competency | Assessment requires evidence that the candidate:   * 1. Carried out ***landscaping*** as per integrated national land use guidelines, 2011   2. Mapped environmental sensitive ***ecosystems***  as per work requirements   3. Created ecological trails are as per work procedures.   4. Carried forest ***resources inventory***  out as per work requirements   5. Implemented forest ***resources inventory recommendations***  as per work procedures   6. Carried ***fangeland Inventory resources*** out as per work procedures   7. Implemented ***rangeland inventory recommendations*** as per work procedures   8. Sampled water quality as per EMCA (water quality) regulations,2006 |
| 1. 2. Resource Implications | The following resources should be provided:   1. Appropriately simulated environment where assessment can take place 2. Access to relevant work environment 3. Resources relevant to the proposed activity or tasks |
| 3. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical demonstrations   2. Oral questioning   3. Written assessment   4. Portfolio of Evidence   5. Interview   6. Third party report |
| 1. 4. Context of Assessment | Competency may be assessed:   * 1. Workplace   2. Simulated work environment |
| 1. 5. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |