****

**REPUBLIC OF KENYA**

**COMPETENCY BASED CURRICULUM**

**FOR**

**OIL PIPELINE LABARATORY TECHNOLOGY**

**LEVEL 5**



TVET CDACC

P.O. BOX 15745-00100

NAIROBI

First published 2017

Copyright © TVET CDACC

All rights reserved. No part of this curriculum may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods without the prior written permission of the TVET CDACC, except in the case of brief quotations embodied in critical reviews and certain other non-commercial uses permitted by copyright law. For permission requests, write to the Council Secretary/CEO, at the address below:

**Council Secretary/CEO**

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

**P.O. Box 15745–00100**

**Nairobi, Kenya**

**Email: info@tvetcdacc.go.ke / cdacc.tvet@gmail.com**

FOREWORD

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) in conjunction with the Oil and Gas Pipeline Sector Skills Advisory Committee (SSAC) and the Kenya Pipeline Company (KPC) have developed this competency-based curriculum in oil and gas pipeline. This curriculum will allow the trainee to gain competency in assuring quality of refined petroleum products. The curriculum is designed and organized with a clear outline of learning outcomes, specific learning outcomes, suggested delivery methods, training/learning resources and methods of assessing the trainees’ achievement. The curriculum is competency-based, allowing for the trainee’s exit to the world of work and easy re-entry to the course.

I am grateful to the staff of TVET CDACC, council technical committee members, course panel members at KPC, Oil and Gas Pipeline SSAC members and all those who participated in the development and production of this curriculum.

**Prof CHARLES M.M. ONDIEKI, PhD, FIET (K), Con. EngTech.**

**CHAIRMAN TVET CDACC**

PREFACE

Kenya, through the Ministry of Education chairs the human resource capacity building cluster of the Northern Corridor Integration Projects involving the partner states of Kenya, Uganda, South Sudan, Ethiopia and Rwanda. This cluster aims at building capacity for the railways, energy, petroleum and information and communication technology (ICT) sectors.

This curriculum has been developed as part of the effort to build the human resource capacity for oil and gas pipelines for the Northern Corridor Integration Projects. The curriculum is competency-based and market-driven, as it has been developed in collaboration with industry players through the Oil and Gas Pipeline Sector Skills Advisory Committee.

It is my conviction that the implementation of this curriculum will play a great role towards the training of competent oil pipeline laboratory technologists needed not only for the implementation of the Northern Corridor Integration Projects, but also for the oil and gas pipeline sector as a whole. The Technical and Vocational Education and Training Authority (TVETA) will quality assure programmes launched under this CBET curriculum.

**DIRECTOR, TECHNICAL TRAINING MINISTRY OF EDUCATION**

**ACKNOWLEDGEMENT**

In developing this curriculum, significant involvement and support was received from various persons and organisations to make it inclusive in terms of content for the benefit of all who will use it. The curriculum has been designed for competency based training and has independent units of competence that allow the trainee flexibility in entry and exit.

I take this opportunity to acknowledge the Kenya Pipeline Company (KPC) board of directors and management for initiating and supporting the process of developing this curriculum.

The TVET CDCC recognizes with appreciation the role of the Oil and Gas Pipeline Sector Skills Advisory Committee (SSAC) in ensuring that competencies required by the industry are addressed in the curriculum. We also sincerely thank all stakeholders in the oil and gas sector for their valuable input and all those who participated in the process of developing this curriculum.

We are convinced that this curriculum will go a long way in ensuring that the workers in the oil and gas pipeline sector acquire competencies that will enable them perform their job more efficiently.

**DR. LAWRENCE GUANTAI M’ITONGA, PhD**

**COUNCIL SECRETARY/CEO**

**TVET CDACC**

**ACRONYMS**

ASTM American Standard Test and Materials

CBET Competency-Based Education and Training

CDACC Curriculum Development, Assessment and Certification Council

CR Core Competencies

CU Curriculum

EIC Energy Industries Council

IP Institute of Petroleum

KPC Kenya Pipeline Company

LT Laboratory Technology

OG Oil and Gas

TVET Technical and Vocational Education and Training

TVETA Technical and Vocational Education and Training

Authority

KEY TO UNIT CODE

OG/CU /LT/BC /01/5 / A

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Version control

**Table of Contents**

[FOREWORD iii](#_Toc30033004)

[PREFACE iv](#_Toc30033005)

[ACKNOWLEDGEMENT v](#_Toc30033006)

[ACRONYMS vi](#_Toc30033007)

[KEY TO UNIT CODE vii](#_Toc30033008)

[COURSE OVERVIEW ix](#_Toc30033009)

[BASIC UNITS OF LEARNING 1](#_Toc30033010)

[COMMUNICATION SKILLS 2](#_Toc30033011)

[NUMERACY SKILLS 5](#_Toc30033012)

[DIGITAL LITERACY 10](#_Toc30033013)

[ENTREPRENEURIAL SKILLS 13](#_Toc30033014)

[EMPLOYABILITY SKILLS 17](#_Toc30033015)

[ENVIRONMENTAL LITERACY 22](#_Toc30033016)

[OCCUPATIONAL SAFETY AND HEALTH PRACTICES 25](#_Toc30033017)

[CORE UNITS OF LEARNING 28](#_Toc30033018)

[TESTING GROUND FUEL 29](#_Toc30033019)

[TESTING JET A-1 AVIATION FUEL 35](#_Toc30033020)

[DETERMINATION OF PETROLEUM PRODUCT MOVEMENT QUALITY REQUIREMENTS 41](#_Toc30033021)

[HANDLING QUALITY CONTROL OF JET A-1 FUEL 46](#_Toc30033022)

[LABORATORY PROCESSES QUALITY ASSURANCE 52](#_Toc30033023)

**COURSE OVERVIEW**

Oil and Gas Level 4’ qualification consists of competencies that a person must achieve to enable him/her to maintain evaporation ponds, wash salt, dry, grind and package salt.

The course will take 1290 hours, and targets laboratory workers in the oil and gas sector who are holders of a diploma or a degree in chemistry from recognized learning institutions. The course allows the trainee to work in the laboratory of any entity that is in involved with handling or testing of refined petroleum products.

This course consists of the following basic, common and core units of learning:

**Basic Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in Hours** | **Credit factor** |
| OG/CU/LT/BC/01/5/A | Communication skills | 25 | 2.5 |
| OG/CU/LT/BC/02/5/A | Numeracy skills | 40 | 4 |
| OG/CU/LT/BC/03/5/A | Digital literacy | 45 | 4.5 |
| OG/CU/LT/BC/04/5/A | Entrepreneurial skills | 70 | 7.0 |
| OG/CU/LT/BC/05/5/A | Employability skills | 50 | 5.0 |
| OG/CU/LT/BC/06/5/A | Environmental literacy | 25 | 2.5 |
| OG/CU/LT/BC/07/5/A | Occupational safety and health practices | 25 | 2.5 |
| **Total** | | **280** | **28.0** |

**Core Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit of Learning Code** | **Unit of Learning Title** | **Duration in Hours** | **Credit Factors** |
| OG/CU/LT/CR/01/5/A | Test ground fuel | 120 | 12 |
| OG/CU/LT/CR/02/5/A | Test jet A-1 fuel | 140 | 14 |
| OG/CU/LT/CR/03/5/A | Determine petroleum product volume | 230 | 23 |
| OG/CU/LT/CR/04/5/A | Handle quality control of Jet A-1 fuel | 170 | 17 |
| OG/CU/LT/CR/05/5/A | Labaratory process quality assuarance | 120 | 12 |
|  | Industrial attachment | 360 | 30 |
| **Total** | | **1140** | 114 |
| **Grand total** | | **1420** |  |

The total duration of the course is 1420 hours including 360 hours’ industrial attachment.

**Entry Requirements**

A trainee entering this course should have any of the following minimum requirements:

1. Kenya Certificate of Secondary Education (K.C.S.E) Mean Grade D

**Or**

1. Equivalent qualification as determined by Kenya National Qualifications Authority (KNQA)

**Assessment**

The course will be assessed at two levels: internally and externally. Internal assessment is continuous and is conducted by the trainer who is monitored by an internal verifier, while external assessment is the responsibility of TVET CDACC.

**Certification**

On demonstration of competence in a unit of learning, a trainee will be awarded a Record of Achievement a letter and on demonstration of competence in all units of learning a trainee will be issued with a Certificate in Oil Pipeline Laboratory Technology. These certificates will be awarded by TVET CDACC in conjunction with the training provider.

**BASIC UNITS OF LEARNING**

# COMMUNICATION SKILLS

**UNIT CODE:** **OG/CU/LT/BC/01/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Demonstrate communication skills

**Duration of Unit:** 25 hours

**Unit Description**

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

**Summary of Learning Outcomes**

1. Meet communication needs of clients and colleagues
2. Contribute to the development of communication strategies
3. Conduct interviews
4. Facilitate group discussions
5. Represent the organization

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Meet communication needs of clients and colleagues | * Communication process * Modes of communication * Medium of communication * Effective communication * Barriers to communication * Flow of communication * Sources of information * Organizational policies * Organization requirements for written and electronic communication methods * Report writing * Effective questioning techniques (clarifying and probing) * Workplace etiquette * Ethical work practices in handling communication * Active listening * Feedback * Interpretation * Flexibility in communication | * Observation * Oral |
| 1. Contribute to the development of communication strategies | * Dynamics of groups * Styles of group leadership * Openness and flexibility in communication * Communication skills relevant to client groups | * Written * Observation |
| 1. Conduct interviews | * Types of interview * Establishing rapport * Facilitating resolution of issues * Developing action plans | * Written * Observation |
| 1. Facilitate group discussions | * Identification of communication needs * Dynamics of groups * Styles of group leadership * Presentation of information * Encouraging group members participation * Evaluating group communication strategies | * Written * Observation |
| 1. Represent the organization | * Presentation techniques * Development of a presentation * Multi-media utilization in presentation * Communication skills relevant to client groups | * Observation * Written |

**Suggested Delivery Methods**

* Interview
* Role playing
* Observation
* Viewing of related videos

**Recommended Resources**

* Desktop computers/laptops
* Internet connection
* Projectors
* Telephone

**NUMERACY SKILLS**

**UNIT CODE:** **OG/CU/LT/BC/02/5/A**

**Relationship to Occupational Standards:**

This unit addresses the unit of competency: Demonstrate numeracy skills

**Duration of Unit:** 40hours

**Unit Description**

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

**Summary of Learning Outcomes**

1. Calculate with whole numbers and familiar fractions, decimals and percentages for work
2. Estimate, measure and calculate with routine metric measurements for work
3. Use routine maps and plans for work
4. Interpret, draw and construct 2D and 3D shapes for work
5. Interpret routine tables, graphs and charts for work
6. Collect data and construct routine tables and graphs for work
7. Use basic functions of calculator

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Calculate with whole numbers and familiar fractions, decimals and percentages for work | * Interpretation of whole numbers, fractions, decimals, percentages and rates * Calculations involving several steps * Calculation with whole numbers and routine or familiar fractions, decimals and percentages * Conversion between equivalent forms of fractions, decimals and percentages * Application of order of operations to solve multi-step calculations * Application of problem solving strategies * Making estimations to check reasonableness of problem solving process, outcome and its appropriateness to the context and task * Use of formal and informal mathematical language and symbolism to communicate the result of a task | * Oral * Written * Practical test * Observation |
| 1. Estimate, measure and calculate with routine metric measurements for work | * Selection and interpretation of measurement information in workplace tasks and texts * Identification and selection of routine measuring equipment * Estimation and making measurements using correct units * Estimation and calculation using routine measurements * Performing conversions between routinely used metric units * Using problem solving processes to undertake tasks * Recording information using mathematical language and symbols | * Oral * Written * Practical test * Observation |
| 1. Use routine maps and plans for work | * Identification of features in routine maps and plans * Symbols and keys used in routine maps and plans * Identification and interpretation of orientation of map to North * Demonstrate understanding of direction and location * Apply simple scale to estimate length of objects, or distance to location or object * Give and receive directions using both formal and informal language | * Oral * Written * Practical test * Observation |
| 1. Interpret, draw and construct 2D and 3D shapes for work | * Identify two dimensional shapes and routine three dimensional shapes in everyday objects and in different orientations * Explain the use and application of shapes * Use formal and informal mathematical language and symbols to describe and compare the features of two dimensional shapes and routine three dimensional shapes * Identify common angles * Estimate common angles in everyday objects * Use formal and informal mathematical language to describe and compare common angles * Use common geometric instruments to draw two dimensional shapes * Construct routine three dimensional objects from given nets | * Oral * Written * Practical test * Observation |
| 1. Interpret routine tables, graphs and charts for work | * Identify routine tables, graphs and charts in predominately familiar texts and contexts * Identify common types of graphs and their different uses * Identify features of tables, graphs and charts * Locate specific information * Perform calculations to interpret information * Explain how statistics can inform and persuade * Identify misleading statistical information * Discuss information relevant to the workplace | * Oral * Written * Practical test * Observation |
| 1. Collect data and construct routine tables and graphs for work | * Identify features of common tables and graphs * Identify uses of different tables and graphs * Determine data and variables to be collected * Determine audience * Select a method to collect data * Collect data * Collate information in a table * Determine suitable scale and axes * Draft and draw graph to present information * Check that data meets the expected results and context * Report or discuss information using formal and informal mathematical language | * Oral * Written * Practical test * Observation |
| 1. Use basic functions of calculator | * Identify and use keys for basic functions on a calculator * Calculate using whole numbers, money and routine decimals and percentages * Calculate with routine fractions and percentages * Apply order of operations to solve multi-step calculations * Interpret display and record result * Make estimations to check reasonableness of problem solving process, outcome and its appropriateness to the context and task * Use formal and informal mathematical language and appropriate symbolism and conventions to communicate the result of the task | * Oral * Written * Practical test * Observation |

**Suggested Delivery Methods**

* Instructor led facilitation of theory
* Practical demonstration of tasks by trainer
* Practice by trainees/ role play
* Discussion
* Observations and comments and corrections by trainers

**Recommended Resources**

* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Mathematical tables

# DIGITAL LITERACY

**UNIT CODE: OG/CU/LT/BC/03/5/A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate digital literacy

**Duration of Unit:** 45 hours

**Unit Description**

This unit describes competencies required to use a computer and other digital devices for the purposes of communication, work performance and management at the workplace

**Summary of Learning Outcomes**

1. Identify computer software and hardware
2. Apply security measures to data, hardware, software in automated environment
3. Apply computer software in solving tasks
4. Apply internet and email in communication at workplace
5. Apply desktop publishing in official assignments
6. Prepare presentation packages

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify computer hardware and software | * Concepts of ICT * Functions of ICT * History of computers * Components of a computer * Classification of computers | * Written tests * Oral presentation * Observation |
| 1. Apply security measures to data, hardware and software | * Data security and control * Security threats and control measures * Types of computer crimes * Detection and protection against computer crimes * Laws governing protection of ICT | * Written tests * Oral presentation * Observation * Project |
| 1. Apply computer software in solving tasks | * Operating system * Word processing * Spread sheets * Data base design and manipulation * Data manipulation, storage and retrieval | * Oral questioning * Observation * Project |
| 1. Apply internet and email in communication at workplace | * Computer networks * Network configurations * Uses of internet * Electronic mail (e-mail) concept | * Oral questioning * Observation * Oral presentation * Written report |
| 1. Apply desktop publishing in official assignments | * Concept of desktop publishing * Opening publication window * Identifying different tools and tool bars * Determining page layout * Opening, saving and closing files * Drawing various shapes using DTP * Using colour pellets to enhance a document * Inserting text frames * Importing and exporting text * Object linking and embedding * Designing of various publications * Printing of various publications | * Oral questioning * Observation * Oral presentation * Written report * Project |
| 1. Prepare presentation packages | * Types of presentation packages * Procedure of creating slides * Formatting slides * Presentation of slides * Procedure for editing objects | * Oral questioning * Observation * Oral presentation * Written report * Project |

**Suggested Delivery Methods**

* Instructor led facilitation of theory
* Demonstration by trainer
* Practical work by trainee
* Viewing of related videos
* Project
* Group discussions

**Recommended Resources**

* Desk top computers
* Laptop computers
* Other digital devices
* Printers
* Storage devices
* Internet access
* Computer software

# ENTREPRENEURIAL SKILLS

**UNIT CODE: OG/CU/LT/BC/4/5/A**

**Relationship to occupational standards**

This unit addresses the unit of competency: Demonstrate entrepreneurial skills

**Duration of unit:** 70 hours

**Unit description**

This unit describes the competencies critical to demonstration of entrepreneurial capabilities. It involves, enhancing the entrepreneur’s business skills, fostering a culture of continuous improvement at individual and organization level, implementing appropriate internal controls for profitability, improving employed capital base and undertaking regional/county business expansion.

**Summary of Learning Outcomes**

1. Develop one’s business skill
2. Develop individual workers and teams
3. Expand markets and customers
4. Expand employed capital
5. Undertake regional/county business expansion
6. Develop business Innovative strategies
7. Develop new products/ markets

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Develop one’s business skill | * Entrepreneurial skills development * Market trends * Monitoring and anticipating market trends * New technologies in entrepreneurship * Products and processes in entrepreneurship * Linkages with other entrepreneurs * Business conventions ad exhibitions * Personal improvement and growth | * Observation * Case studies * Individual/group assignments * Projects * Written * Oral |
| 1. Develop individual workers and teams | * Good staff/workers * Team building and team work * Staff development and enhancement * Culture of continuous improvement * Increasing products and services * Marketing improvement * Intrapreneurship | * Observation * Case studies * Individual/group assignments * projects * Written * Oral |
| 1. Expand markets and customers base | * Maintaining appropriate cash flow in the organization * Internal controls * Business break-even point * Business profitability determinants * Prudent purchases in an enterprise * Reducing business expenses * Good staff/workers and customer relations * Identifying and maintain new customers and markets * Product/ service promotions * Products / services diversification * SWOT / PESTEL analysis * Conducting a business survey * Market expansion * Small business records management * Book keeping and auditing for small businesses * Business support services * Small business resources mobilization and utilization * Basic business social responsibility * Management of small business * Word processing concepts in small business management * Computer application software * Monitoring and controlling business operations | * Oral * Observation * Case studies * Individual/group assignments * projects * Written |
| 1. Expand employed capital | * Employed capital in small businesses * Share holdings * Business expansion and diversification * Resources for growing small business * Small business Strategic Plan * Cooperate Social responsibility * Computer software in business development * ICT and business growth | * Observation * Case studies * Individual/group assignments * projects * Written |
| 1. Undertake county/regional business expansion | * Region identification process * Regional laws and regulation * Business regional expansion requirements | * Oral * Observation * Case studies * Individual/group assignments * projects * Written |
|  |  |  |
|  |  |  |

**Suggested Delivery Methods**

* Instructor led facilitation of theory
* Demonstration by trainer
* Practice by trainee
* Role play
* Case study

**Recommended Resources**

* Case studies for small businesses
* Business plan templates
* Lap top/ desk top computer
* Internet
* Telephone
* Writing materials

# EMPLOYABILITY SKILLS

**UNIT CODE:** **OG/CU/LT/BC/05/5/A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate employability skills

**Duration of Unit:** 50 hours

**Unit Description**

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

**Summary of Learning Outcomes**

1. Conduct self-management

2. Demonstrate interpersonal communication

3. Demonstrate critical safe work habits

4. Lead small teams

5. Plan and organize work

6. Maintain professional growth and development

7. Demonstrate workplace learning

8. Demonstrate problem solving skills

9. Demonstrate workplace ethics

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| * 1. Conduct self-management | * Self-awareness * Formulating personal vision, mission and goals * Strategies for overcoming life challenges * Emotional intelligence * Assertiveness versus aggressiveness * Expressing personal thoughts, feelings and beliefs * Developing and maintaining high self-esteem * Developing and maintaining positive self-image * Articulating ideas and aspirations * Accountability and responsibility * Good work habits * Self-awareness * Self-development * Financial literacy * Healthy lifestyle practices | * Observation * Written * Oral interview * Third party report |
| 1. Demonstrate interpersonal communication | * Meaning of interpersonal communication * Listening skills * Types of audience * Writing skills * Reading skills * Meaning of empathy * Understanding customers’ needs * Establishing communication networks * Sharing information | * Observation * Written * Oral interview  1. Third party report |
| 1. Demonstrate critical safe work habits | * Stress and stress management * Punctuality and time consciousness * Leisure * Integratingpersonal objectives into organizational objectives * Resources utilization * Setting work priorities * HIV and AIDS * Drug and substance abuse * Handling emerging issues | * Observation * Written * Oral interview * Third party report |
| 1. Lead a small team | * Leadership qualities * Team building * Determination of team roles and objectives * Team performance indicators * Responsibilities in a team * Forms of communication * Complementing team activities * Gender and gender mainstreaming * Human rights * Maintaining relationships * Conflicts and conflict resolution | * Observation * Oral interview * Written * Third party report |
| 1. Plan and organize work | * Functions of management * Planning * Organizing * Time management * Decision making process * Task allocation * Evaluating work activities * Resource utilization * Problem solving * Collecting and organising information | * Observation * Oral interview * Written * Third party report |
| 1. Maintain professional growth and development | * Opportunities for professional growth * Assessing training needs * Licenses and certifications for professional growth and development * Pursuing personal and organizational goals * Identifying work priorities * Recognizing career advancement | * Observation * Oral interview * Written * Third party report |
| 1. Demonstrate workplace learning | * Managing own learning * Contributing to the learning community at the workplace * Cultural aspects of work * Variety of learning context * Application of learning * Safe use of technology * Identifying opportunities * Generating new ideas * Workplace innovation * Performance improvement * Handling emerging issues * Future trends and concerns in learning | * Observation * Oral interview * Written * Third party report |
| 1. Demonstrate problem solving skills | * Problem identification * Problem solving * Application of problem-solving strategies * Resolving customer concerns | * Observation * Oral interview * Written * Third party report |
| 1. Demonstrate workplace ethics | * Meaning of ethics * Ethical perspectives * Principles of ethics * Values and beliefs * Ethical standards * Organization code of ethics * Common ethical dilemmas * Organization culture * Corruption, bribery and conflict of interest * Privacy and data protection * Diversity, harassment and mutual respect * Financial responsibility/accountability * Etiquette * Personal and professional integrity * Commitment to jurisdictional laws * Emerging issues in ethics | * Observation * Oral interview * Written * Third party report |

**Suggested Methods of Delivery**

* Instructor lead facilitation of theory
* Demonstrations
* Simulation/Role play
* Group Discussion
* Presentations
* Projects
* Case studies
* Assignments

**Recommended Resources**

* Computers
* Stationery
* Charts
* Video clips
* Audio tapes
* Radio sets
* TV sets
* LCD projectors

# ENVIRONMENTAL LITERACY

**UNIT CODE: OG/CU/LT/CR/06/5/A**

**Relationship to Occupational Standards**:

This unit addresses the unit standard: **Demonstrate environmental literacy**

**Duration of Unit:** 25 hours

**Unit Description**

This unit describes the competencies required to control environmental hazard, control environmental pollution, comply with workplace sustainable resource use, evaluate current practices in relation to resource usage, identify environmental legislations/conventions for environmental concerns, implement specific environmental programs and monitor activities on environmental protection/programs.

**Summary of Learning Outcomes**

1. Control environmental hazard
2. Control environmental Pollution
3. Demonstrate sustainable resource use
4. Evaluate current practices in relation to resource usage
5. Identify Environmental legislations/conventions for environmental concerns
6. Implement specific environmental programs
7. Monitor activities on Environmental protection/Programs

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Control environmental hazard | * Purposes and content of Environmental Management and Coordination Act 1999 * Purposes and content of Solid Waste Act * Storage methods for environmentally hazardous materials * Disposal methods of hazardous wastes * Types and uses of PPE in line with environmental regulations * Occupational Safety and Health Standards (OSHS) | * Written questions * Oral questions * Observation of work procedures |
| 1. Control environmental Pollution control | * Types of pollution * Environmental pollution control measures * Types of solid wastes * Procedures for solid waste management * Different types of noise pollution * Methods for minimizing noise pollution | * Written questions * Oral questions * Observation of work procedures * Role play |
| 1. Demonstrate sustainable resource use | * Types of resources * Techniques in measuring current usage of resources * Calculating current usage of resources * Methods for minimizing wastage * Waste management procedures * Principles of 3Rs (Reduce, Reuse, Recycle) * Methods for economizing or reducing resource consumption | * Written questions * Oral questions * Observation of work procedures * Role play |
| 1. Evaluate current practices in relation to resource usage | * Collection of information on environmental and resource efficiency systems and procedures, * Measurement and recording of current resource usage * Analysis and recording of current purchasing strategies. * Analysis of current work processes to access information and data * Identification of areas for improvement | * Written questions * Oral questions * Observation of work procedures * Role play |
| 1. Identify Environmental legislations/conventions for environmental concerns | * Environmental issues/concerns * Environmental legislations /conventions and local ordinances * Industrial standard /environmental practices * International Environmental Protocols (Montreal, Kyoto) * Features of an environmental strategy | * Written questions * Oral questions * Observation of work procedures |
| 1. Implement specific environmental programs | * Community needs and expectations * Resource availability * 5 s of good housekeeping * Identification of programs/Activities * Setting of individual roles /responsibilities * Resolving problems /constraints encountered * Consultation with stakeholders | * Written questions * Oral questions * Observation of work procedures * Role play |
| 1. Monitor activities on Environmental protection/Programs | * Periodic monitoring and Evaluation of activities * Gathering feedback from stakeholders * Analysing data gathered * Documentation of recommendations and submission * Setting of management support systems to sustain and enhance the program * Monitoring and reporting of environmental incidents to concerned /proper authorities | * Oral questions * Written tests * Practical test * Observation |

**Suggested Delivery Methods**

* Instructor led facilitation of theory
* Demonstration by trainer
* Practical work by trainee
* Viewing of related videos

**Recommended Resources**

* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Environmental Management and Coordination Act 1999
* Machine/equipment manufacturer’s specifications and instructions
* Personal Protective Equipment (PPE)
* ISO standards
* Ccompany environmental management systems (EMS)
* Montreal Protocol
* Kyoto Protocol

# OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** **OG/CU/LT/BC/07/5/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Demonstrate occupational safety and health practices

**Duration of Unit:** 25 hours

**Unit Description**

This unit describes the competencies required to comply with regulatory and organizational requirements for occupational safety and health.

**Summary of Learning Outcomes**

1. Identify workplace hazards and risk
2. Identify and implement appropriate control measures to hazards and risks
3. Implement OSH programs, procedures and policies/guidelines

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment**  **Methods** |
| * 1. Identify workplace hazards and risks | * Identification of hazards in the workplace and/or the indicators of their presence * Evaluation and/or work environment measurements of OSH hazards/risk existing in the workplace is conducted by * Authorized personnel or agency * Gathering of OHS issues and/or concerns raised | * Oral questions * Written tests * Observation of trainees identify hazards and risks |
| * 1. Identify and implement appropriate control measure to hazards and risks | * Prevention and control measures, including use of PPE (personal protective equipment) for specific hazards are identified and implemented * Appropriate risk controls based on result of OSH hazard evaluation is recommended * Contingency measures, including emergency procedures during workplace incidents and emergencies are recognized and established in accordance with organization procedures | * Oral questions * Written tests * Practical test   Observation of implementation of control measures |
| * 1. Implement OSH programs, procedures and policies/guidelines | * Providing information to work team about company OHS program, procedures and policies/guidelines * Participating in implementation of OSH procedures and policies/ guidelines * Training of team members and advice on OSH standards and procedures * Implementation of procedures for maintaining OSH-related records | * Oral questions * Written tests * Practical test * Observation |

**Suggested Delivery Methods**

* Instructor led facilitation of theory
* Demonstration by trainer
* Practical work by trainee
* Viewing of related videos

**Recommended Resources**

* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Machine/equipment manufacturer’s specifications and instructions
* Personal Protective Equipment (PPE) e.g.
* Mask
* Face mask/shield
* Safety boots
* Safety harness
* Arm/Hand guard, gloves
* Eye protection (goggles, shield)
* Hearing protection (ear muffs, ear plugs)
* Hair Net/cap/bonnet
* Hard hat
* Face protection (mask, shield)
* Apron/Gown/coverall/jump suit
* Anti-static suits
* High-visibility reflective vest

**CORE UNITS OF LEARNING**

**TESTING GROUND FUEL**

Unit Code: **OG/CU/LT/CR/01/5/A**

Relationship to Occupational Standards**:**

This unit addresses the unit standard: Test ground fuels

**Duration of Unit:** 120 hours

Unit Description

This unit describes the skills, knowledge and attitudes required by oil pipeline Laboratory Technologist in order to competently and safely test ground fuels in the laboratory.

Summary of Learning Outcomes

* 1. Apply workplace safety
  2. Apply workplace ethics in laboratory testing
  3. Apply housekeeping principles in the laboratory
  4. Prepare samples and equipment for ground fuels testing
  5. Test ground fuels
  6. Complete the testing process

Learning Outcomes, Specific Learning Outcomes, Content and Suggested Assessment Methods

|  |  |  |
| --- | --- | --- |
| **Learning Outcome 1:** Apply workplace safety | | |
| **Specific Learning Outcomes** | **Content** | **Suggested Assessment**  **Methods** |
| 1.1 Develop safety plan for testing | * Elements of safety plan * How to develop the safety plan | * Observation |
| 1.2 Present a toolbox talk | * Definitions of toolbox * Safety working practices * How to conduct talks * Benefits of toolbox talk | * Observation |
| 1.3 Identify correct PPE for the task | * Meaning of the term PPE * Types of PPE * Purpose of PPE | * Written * Observation |
| 1.4 Demonstrate correct wearing of PPE | * Safe and correct handling, use, maintenance and storage of different   types of PPE | * Observation |
| 1.5 Demonstrate correct handling of petroleum  products and chemicals | * Safe handling of petroleum products and chemicals | * Observation |
| 1.6 Report any incidents, hazards and  risks | * Hazards associated with testing ground fuels in the laboratory | * Written * Observation |
| **Learning Outcome 2:** Apply workplace ethics in laboratory  testing | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** |
| 1.1 Apply  laboratory ethics | * Meaning of laboratory ethics * Types of laboratory misconduct * Fraud or scientific misconduct * Procedural deception * Measurement deception * Sources of laboratory fraud * Procedural deceptions * External influences * Inducements * Consequences of unethical conduct * Conflict of interests | * Written * Observation |
| 1.2 Detect  laboratory unethical conduct | * Methods of detection and deterrence * Sources of information on unethical conduct * Areas of vulnerability | * Written * Observation |

|  |  |  |
| --- | --- | --- |
| **Learning Outcome 3:** Apply housekeeping principles in the  laboratory | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** |
| 3.1 Clean  workplace before, during, after testing | * Purpose of cleaning * Regulatory guidelines * Methods of cleaning | * Observation |
| 3.2 Handle and store apparatus and  equipment safely. | * Care of apparatus, equipment and consumables by type * Stowage of apparatus, equipment and consumables by type | * Observation |
| 3.3 Work safe | * Observing the “do’s” and “don’ts” of the laboratory * Safe handling and disposal of laboratory wastes | * Observation * Oral questions |
| **Learning Outcome 4:** Prepare samples and equipment for ground  fuels testing | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** |
| 4.1 Prepare test plans | * Meaning of test plans * Types of test plans * How to prepare test plans | * Inspection of records * Written |
| 4.2 Prepare test equipment | * Types of test equipment * Setting up test equipment * Test equipment reliability checks * Test-running the equipment * Confirming calibration status | * Observation |
| 5 Condition the test sample | * Process of conditioning samples * Samples handling protocol | * Observation |
| **Learning Outcome 5:** Test ground fuels | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** |
| 5.1. Carry out  sample tests | * Safety precautions * Methods of sample testing * Process control during testing | * Observation * written |
| 5.2. Evaluate test results | * Types of quality certificates * Source * Pre-discharge * Recertification * Release * Comparison of the obtained result with expected results * Comparison of the test results with the national specification | * Written * Observation * Oral |
| 5.3. Record test results | * Methods of recording results * Sample custody management | * Observation * Inspect records |
| **Learning Outcome 6:** Complete the testing process | | |
| **Specific**  **Learning Outcomes** | **Content** | **Suggested**  **Assessment Methods** |
| 6.1 Disassemble test equipment | * Methods of cleaning and inspecting test equipment * Techniques of safely disassembling test equipment * Stowing the equipment and apparatus safely | * Observation |
| 6.2 Dispose test specimen | * Types of test specimen * Methods of handling and disposing test specimen * Regulatory guidelines for handling hazardous substances | * Observation |
| 6.3 Stow testing equipment and samples | * Equipment stowing requirements * Sample custody and stowing requirements | * Observation * written |
| 6.4 Prepare  report | * Structure and content of report * Checking and approvals | * Written * Observation |

**Suggested Delivery Methods**

* Instructor-led facilitation of theory
* Demonstration of task by trainer
* Practice by trainee

List of Recommended Resources

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Equipment** | | **Apparatus** | | **Materials** |
| Distillation | | Distillation flask, distillation thermometers (high and low range) | | Stoppers, |
| Density | | Syringe, 250 mL measuring cylinders, appropriate hydrometers, density thermometers, density measurement bath | | Water |
| Flash point -Abel | | Able flash point test cup, bath, thermometers | | Water |
| Flash point -PM | | PM flash point test cup, thermometers | | Blotting papers |
| Copper corrosion | | Copper strips, test bomb, oil bath | |  |
| Colour ASTM | | Tint-meter, curettes, | |  |
| Particulate matter quantification | | Low-pressure suction pump, drying oven, balance, tong or pincers | |  |
| Smoke point tester | | Extractor solvent, wicks, | |  |
| Organoleptic test and appearance | | Sensory appeal | |  |
| **Consumables:** | |
| LPG, detergents, mutton cloth, | |
| **PPE:** | |
| Safety shoes, gloves, dust coat, gas masks, | |
| **References** | |
| 1. ASTM Test Method: Fossil Fuels, 2. EI test method, 3. ISO test methods, 4. ISO standards | |

**TESTING JET A-1 AVIATION FUEL**

**Unit Code: OG/CU/LT/CR/02/5/A**

Relationship to Occupational Standards

This unit addresses the unit standard: Test Jet A-1 fuel

**Duration of Unit:** 140 hours

Unit Description

This unit describes the skills, knowledge and attitudes required by oil pipeline Laboratory Technologist in order to competently and safely test Jet A-1 fuel in the laboratory using the appropriate test equipment and following the documented test methods.

Summary of Learning Outcomes

1. Apply laboratory workplace safety
2. Apply workplace ethics in laboratory testing
3. Apply housekeeping principles to testing area
4. Prepare for Jet A-1 fuel testing
5. Test Jet A-1 fuel samples
6. Complete testing processes

Learning Outcomes, Specific Learning Outcomes and Content

|  |  |  |  |
| --- | --- | --- | --- |
| **Learning Outcome 1:** Apply Laboratory Workplace Safety | | | |
| **Specific Learning**  **Outcomes** | | **Content** | **Suggested Assessment**  **Methods** |
| 1.1 Identify  correct PPE for the job | | * Meaning of term PPE * Types of PPE * Purpose of PPE | * Written   assessment   * Observation |
| 1.2 Demonstrate correct wearing of  PPE | | * Safe and correct handling, use, maintenance and storage   of different types of PPE | * Observation |
| 1.3 Demonstrate correct handling of Jet A-1 fuel, additives and  chemicals | | * Safe handling of Jet A-1 fuel, additives and chemicals | * Observation   of Jet A-1 fuel, additives and chemicals  handling |
| 1.4 Report any incidents, hazards and  risks | | * Hazards associated with handling Jet A-1 fuel * Risk assessment and reporting | * Written * Observation |
| **Learning Outcome 2:** Apply workplace ethics in laboratory  testing | | | |
| **Specific**  **Learning Outcomes** | | **Content** | **Suggested**  **Assessment Methods** |
| 2.1 Apply ethics to testing of petroleum products | | * What is lab fraud or scientific misconduct? * Potential areas of deception or abuse | * Written   assessment |
|  | | * Mitigating procedural and measurement deception * Detection and deterrence |  |
| 2.2 Identify areas of concerns for ethics | | * Areas of vulnerability * Procedural deceptions * External influences * Consequences of unethical conduct * Inducements | * Written   assessment |
| **Learning Outcome 3:** Apply housekeeping principles to testing  area | | | |
| **Specific Learning**  **Outcomes** | | **Content** | **Suggested Assessment**  **Methods** |
| 3.1. Clean  workplace before and after testing | | * Reasons for cleaning * What is a clean workplace in the laboratory * Purpose of cleaning and storage | * Observation |
| 3.2. Handle and store apparatus and equipment safely | | * Caring of apparatus, equipment and consumables by type * Storing of apparatus, equipment and consumables * Reasoning for care and storage | * Written assessment * Observation |
| 3.3. Conduct self safely | | * Following the “do’s” and “don’ts” of the laboratory * Observing signs of danger | * Observation |
| **Learning Outcome 4:** Prepare for Jet A-1 fuel testing | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** |
| 6 Prepare Jet A-1 fuel test  plan | * Meaning of test plans * How to prepare Jet A-1 fuel test plan | * Inspection of records * written |
| 7 Prepare Jet A-1 fuel test equipment | * Types of test equipment * Setting up test equipment * Test equipment reliability checks * Test-running the equipment * Confirming calibration status | * Observation |
| 8 Condition Jet A-1 fuel test sample | * Process of conditioning samples * Samples handling protocol | * Observation |
| **Learning Outcome 5:** Test Jet A-1 fuel samples | | |
| **Specific**  **Learning Outcomes** | **Content** | **Suggested**  **Assessment Methods** |
| 5.1 Carry out Jet A-1 fuelsample tests | * Safety precautions to be taken * Methods of sample testing * Process control during testing | * Observation * Written |
| 5.2 Evaluate Jet A-1 fuel test results | * Types of quality certificates * Refinery * Load port * Pre-discharge * Recertification | * Written * Observation * Oral |
|  | * Release * Draining * Comparison of obtained with expected results * Comparison of the test results with the JIG specification |  |
| 5.3 Record Jet A- 1 fuel test results | * Methods of recording results * Sample custody management | * Observation * Inspection of records |
| **Learning Outcome 6:** Complete testing processes | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** |
| 6.1 Disassemb le Jet A-1 fuel test equipment | * Methods of cleaning and inspecting test equipment * Techniques of safely disassembling test equipment * Stowing the equipment and apparatus safely | * Observation |
| 6.2 Dispose  Jet A-1 fuel test specimen | * Types of test specimen * Methods of handling and disposing test specimen * Regulatory guidelines for handling hazardous   substances | * Observation |
| 6.3 Stow Jet  A-1 fuel testing equipment  / samples | * Equipment stowing requirements * Jet A-1 fuel sample custody and stowing requirements | * Observation * Written |
| 6.5 Prepare  report | * Structure and content of report * Checking and approvals | * Written * Observation |

**Suggested Delivery Methods**

* Instructor-led facilitation of theory
* Demonstration of task by trainer
* Practice by trainee

List of Recommended Resources

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Equipment** | **Apparatus** | | **Materials** | |
| Distillation | Distillation flask, distillation thermometers (low range) | | Silicon stoppers, | |
| Density | Syringe, 250 ml measuring cylinders, appropriate hydrometers, density thermometers | |  | |
| Flash point – Abel | Able flash point test cup, bath, thermometers | | Water, LPG | |
| Existent gum | Existent gum beakers, steam generator with super heater, weighing balance, desiccator, cleaning chemicals, detergents, | | Steam | |
| Copper corrosion | Copper strips, test bomb, oil bath, tong, vice | | Emery cloth, | |
| Colour saybolt | Tint-meter, curettes | |  | |
| Particulate matter quantification | Low pressure suction pump, drying oven, balance, tong or pincers |  | |
| Smoke point tester | Extractor solvent, wicks, |  | |
| Particle counter | Sample delivery syringes, |  | |
| Jet fuel thermal oxidation test (JFTOT) | JFTOT equipment kit, | Blotting papers, | |
| Electrical conductivity meter |  |  | |
| **Consumables:** | | | |
| Membranes, water, detergents, solvents | | | |
| **PPE:** | | | |
| Safety Shoes, Gloves, Dust Coat, Gas Masks, | | | |
| References | | | |
| 1. ASTM Test Method: Fossil Fuels 2. IEC test method 3. ISO test methods 4. ISO standards 5. JIG guidelines | | | |

**DETERMINATION OF PETROLEUM PRODUCT MOVEMENT QUALITY REQUIREMENTS**

**Unit Code: OG/CU/LT/CR/03/5/A**

Relationship to Occupational Standards

This unit addresses the unit standard: Determine petroleum product movement quality requirements

**Duration of Unit:** 230 hours

Unit Description

This unit describes the skills, knowledge and attitudes required by oil pipeline Laboratory Technologist in order to competently and safely determine product quality so as to advice product movement. This is done following documented test methods.

Summary of Learning Outcomes

1. Apply laboratory workplace safety
2. Apply workplace ethics in laboratory testing
3. Apply housekeeping principles to testing area
4. Prepare product movement quality advice
5. Monitor product movement process

Learning Outcomes, Specific Learning Outcomes, Content and Suggested Assessment Methods

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Learning Outcome 1:** Apply laboratory workplace safety | | | | | |
| **Specific Learning Outcomes** | **Content** | | **Suggested Assessment**  **Methods** | | |
| 1.1 Identify correct PPE for the  task | * Meaning of term PPE * Types of PPE * Purpose of PPE | | * Observation | | |
| 1.2 Demonstrate correct wearing of PPE | * Safe and correct handling, use, maintenance and   storage of different types of PPE | | * Observation | | |
| 1.3 Demonstrate correct product handling and  blending | * Safe handling of petroleum products, | | * Observation | | |
| 1.4 Report any incidents, hazards and  risks | * Hazards associated with handling Jet A-1 fuel * Risk assessment and reporting | | * Observation | | |
| **Learning Outcome 2:** Apply workplace ethics in laboratory  testing | | | | | |
| **Specific Learning Outcomes** | **Content** | | **Suggested**  **Assessment Methods** | | |
| 2.1 Understanding the ethics applicable to testing of petroleum products | * What is lab fraud or scientific misconduct? * Potential areas of deception or abuse * Procedural deception * Measurement deception * Detection and deterrence * Consequences | | * Written assessment | | |
| 2.2 Identify areas of concerns for ethics | * Areas of vulnerability * Procedural deceptions * External influences * Consequences of unethical conducts * Inducements | | * Written assessment | |
| **Learning Outcome 3:** Apply housekeeping principles to testing  area | | | | |
| **Specific Learning Outcomes** | **Content** | | **Suggested Assessment**  **Methods** | |
| 3.1. Clean  workplace before and after testing | * Reasons for cleaning * What is a clean workplace in the laboratory? * Purpose of cleaning and storage | | * Written assessment * Observation | |
| 3.2. Apparatus and equipment are safely handled and stored | * Care of apparatus, equipment and consumables by type * Storage of apparatus, equipment and consumables * Reasons for care and storage | | * Written assessment * Observation | |
| 3.3. Work safe | * The “do’s” and “don’ts” of the   laboratory | | * Observation | |
| **Learning Outcome 4:** Prepare product movement quality advice | | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** | |
| 4.1 Prepare  test plans | * Parameters to be tested in each   petroleum product grade | * Observation | |
| 4.2 Carry out blending trials | * Types of blending trials * Methods of trial blending * Test sample conditioning process | * Observation | |
| **Learning Outcome 5:** Monitor product movement process | | | |
| **Specific**  **Learning Outcomes** | **Content** | **Suggested**  **Assessment Methods** | |
| 5.1. Issue  product moveme nt advice | * Types of movement advice e.g.   + Interface cutting point   + Slop reinjection * Format of movement advice form | * Observation | |
| 5.2. Evaluate the target quality of final product | * Compliance to national specifications * Slop blending * Impact of interface handling on the final quality of the products * Balancing between slop generation and product quality * Monitoring slop reinjection * Monitoring line product quality * Recertifying received product | * Observation | |
| 5.3. Prepare  report | * Structure and contents of   report | * Observation | |

**Suggested Delivery Methods**

* Instructor-led facilitation of theory
* Demonstration of task by trainer
* Practice by trainee

List of Recommended Resources

|  |  |  |
| --- | --- | --- |
| **Equipment** | **Apparatus** | **Materials** |
| Distillation | Distillation flask, distillation thermometers (low range), 100ml cork-able measuring cylinders, pipettes, | Silicon stoppers, |
| Density | Syringe, 250 ml measuring cylinders, appropriate hydrometers, density thermometers |  |
| Flash point  -PM | Pensky-Martens flash point test equipment, thermometers, 100ml cork-able measuring cylinders, pipettes, |  |
| **Consumables:** | | |
| LPG, water | | |
| **PPE:** | | |
| Safety shoes, gloves, dust coat, helmets | | |
| **References** | | |
| ASTM Test Method: Fossil Fuels IEC test method  ISO test methods ISO standards  National specifications for fuels  JIG guidelines | | |

**HANDLING QUALITY CONTROL OF JET A-1 FUEL**

**Unit Code: OG/CU/LT/CR/04/5/A**

Relationship to Occupational Standards

This unit addresses the unit standard: Perform quality control Jet A-1 fuel handling

**Duration of Unit:** 170 hours

Unit Description

This unit describes the skills, knowledge and attitudes required by oil pipeline Laboratory Technologist in order to competently and safely perform Jet A-1 fuel handling as per JIG requirements

Summary of Learning Outcomes

1. Apply workplace safety
2. Apply workplace ethics
3. Apply housekeeping principles
4. Prepare forJet A-1 fuelhandling
5. PerformJet A-1 fuel handling
6. Evaluate quality of Jet A-1 fuel and complete work processes

Learning Outcomes, Specific Learning Outcomes, Content and Suggested Assessment Methods

|  |  |  |
| --- | --- | --- |
| **Learning Outcome 1:** Apply workplace safety | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** |
| 1.1 Prepare a safety plan | * Observe workplace safety requirements * Observe product handling requirements | * Observation |
| 1.2 Identify  correct PPE for the job | * Meaning of the term PPE * Types of PPE * Purpose of PPE | * Written assessment * Physical selection of PPE from array of options |
| 1.3 Demonstrate correct  wearing of PPE | * Safe and correct handling, use,   maintenance and storage of different types of PPE | * Observation |
| 1.4 Demonstrate correct handling of Jet A-1 fuel, additives and  chemicals | * Safe handling of Jet A-1 fuel, additives and chemicals | * Observation |
| 1.5 Report any incidents, hazards and  risks | * Hazards associated with handling Jet A-1 fuel | * Written assessment * Conduct |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Learning Outcome 2:** Apply workplace ethics | | | | | | | |
| **Specific Learning**  **Outcomes** | **Content** | | | | **Suggested Assessment**  **Methods** | | |
| 2.1 Understandin g the ethics applicable to testing of petroleum products | * What is lab fraud or scientific misconduct? * Potential areas of deception or abuse * Procedural deception * Measurement deception * Detection and deterrence * Consequences | | | | * Written assessment | | |
| 2.2 Identify areas of concerns for ethics | * Areas of vulnerability * Procedural deceptions * External influences * Consequences of unethical conduct * Inducements | | | | * Written assessment | | |
| **Learning Outcome 3:** Apply housekeeping principles | | | | | | | |
| **Specific**  **Learning Outcomes** | **Content** | | | | **Suggested**  **Assessment Methods** | | |
| 3.1. Clean  workplace before and after testing | * Reasons for cleaning * What is a clean workplace in the laboratory? * Purpose of cleaning and storage | | | | * Written   assessment   * Observation | | |
| 3.2. Apparatus and equipment are safely handled  and stored. | * Care of apparatus, equipment and consumables by type * Storage of apparatus, equipment and consumables * Reasons for care and storage | | | | * Written   assessment   * Observation | | |
| 3.3. Safe self-  conduct | * The “do’s” and “don’ts” of the laboratory | | | * Observation * Oral   questions | | |
| 3.4. Inspect  housekeepi ng status | * Evaluation of neatness and cleanliness check * Safe storage of equipment and samples * Ease of access of both testing and safety appliances and equipment | | | * Observation | | |
| **Learning Outcome 4:** Prepare for Jet A-1 fuel handling | | | | | | |
| **Specific**  **Learning Outcomes** | **Content** | **Suggested**  **Assessment Methods** | | | | |
| 4.1 Prepare Jet A-1 fuel quality control check plans | * Detailing jig requirements * Identifying the required apparatus * Preparing the apparatus * Confirming Jet A-1 fuel documentation * Maintaining Jet A-1 fuel traceability to source refinery | * Observation | | | | |
| 4.2 Confirm Jet A-1 fuel stocks and scheduled volume | * Batching requirements for Jet A-1 fuel * Evaluating prevailing daily average Jet A-1 fuel consumption * Evaluating Jet A-1 fuel stocks and projecting the demand * Checking and confirming batching | * Observation | | | | |
|  | * Planning Jet A-1 fuel   receipts |  | | |
| 4.3 Confirm  product electrical conductivity | * Care for Jet A-1 fuel electrical conductivity meters * Using Jet A-1 fuel electrical conductivity meters * Application of conductivity improvers | * Observation | | |
| **Learning Outcome 5:** Perform Jet A-1 fuel handling | | | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** | | |
| 5.1. Perform  the quality control checks | * JIG guidelines on quality control checks * Types of quality control checks   + Receipts   + Issues   + Storage | * Observation | | |
| 5.2. Prepare  product handling plan | * Observing JIG requirements   + Receiving   + Issuing   + Storage * Recording the check results | Observation | | |
| 5.3. Prepare Jet A-1 fuel documents | * Tank release requirements * Receipt and settling requirements * Water draining requirements * Sampling requirements | Observation | | |
| 5.4. Handle Jet A-1 fuel as per the handling plan | * Check the parameters in the handling plan * Compare the test result to the expected quality * Advise the handling process * Oversee sampling and testing | | Observation | | |
| **Learning Outcome 6:** Evaluate quality of Jet A-1 fuel and  complete work processes | | | | | |
| **Specific**  **Learning Outcomes** | **Content** | | **Suggested**  **Assessment Methods** | | |
| 6.1 Confirm the quality of the fuel | * JIG guidelines on fuel quality * Comparison of the test results with the JIG specification | | * Obtained | | |
| 6.2 Prepare Jet A-1 fuel reports | * Types of reports * Structure and content of the report * Requirements of JIG | | * Written assessment * Observation | | |

**Suggested Delivery Methods**

* Instructor-led facilitation of theory
* Demonstration of task by trainer
* Practice by trainee

List of Recommended Resources

|  |  |  |
| --- | --- | --- |
| **Equipment** | **Apparatus** | **Materials** |
| Density | Syringe, 250 ml measuring cylinders, appropriate hydrometers, density thermometers  Wide mouth clear glass jar Daylight source of light | Mutton cloth |
| **Consumables:** | | |
| Membranes, water, detergents, solvents | | |
| **PPE:** | | |
| Safety shoes, gloves, dust coat, helmets | | |
| References | | |
| 1. ASTM Test Method: Fossil Fuels 2. EIC test method 3. ISO test methods 4. ISO standards | | |

**LABORATORY PROCESSES QUALITY ASSURANCE**

**Unit Code: OG/CU/LT/CR/05/5/A**

Relationship to Occupational Standards

This unit addresses the unit standard: Carry out laboratory processes quality assurance

**Duration of Unit:** 120 hours

Unit Description

This unit describes the skills, knowledge and attitudes required by oil pipeline Laboratory Technologist in order to competently and safely perform laboratory processes quality assurance.

Summary of Learning Outcomes

1. Apply workplace safety
2. Apply workplace ethics in laboratory testing
3. Apply housekeeping principles to testing area
4. Prepare for laboratory processes quality assurance
5. Evaluate quality of laboratory processes
6. Complete work processes and document

Learning Outcomes, Specific Learning Outcomes, Content and Suggested Assessment Methods

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Learning Outcome 1:** Apply workplace safety | | | | |
| **Specific Learning**  **Outcomes** | **Content** | | **Suggested Assessment**  **Methods** | |
| 1.1 Prepare a safety plan | * Observe workplace safety requirements * Observe product handling requirements | | * Observation | |
| 1.2 Identify  correct PPE for the job | * Meaning of the term PPE * Types of PPE * Purpose of PPE | | * Observation * written assessment | |
| 1.3 Demonstrate correct  wearing of PPE | * Safe and correct handling, use,   maintenance and storage of different types of PPE | | * Observation | |
| 1.4 Demonstrate correct handling of Jet A-1 fuel,  additives, chemicals | * Safe handling of Jet A-1 fuel, additives and chemicals | | * Observation | |
| 1.5 Report any  incidents, hazards, risks | * Hazards associated with handling Jet A-1 fuel | | * Written assessment | |
| **Learning Outcome 2:** Apply workplace ethics in laboratory  testing | | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** | |
| 2.1 Apply ethics to testing of petroleum products | * What is lab fraud or scientific misconduct? * Potential areas of deception or abuse * Procedural deception * Measurement deception * Detection and deterrence * Consequences | * Written assessment | |
| 2.2 Identify areas of concerns for ethics | * Areas of vulnerability * Procedural deceptions * External influences * Consequences of unethical conduct * Inducements | * Written assessment | |
| **Learning Outcome 3:** Apply housekeeping principles to  testing area | | | |
| **Specific**  **Learning Outcomes** | **Content** | **Suggested**  **Assessment Methods** | |
| 3.1. Clean  workplace before and after testing | * Reasons for cleaning * What is a clean workplace in the laboratory? * Purpose of cleaning and storage | * Written assessment * Observation | |

|  |  |  |  |
| --- | --- | --- | --- |
| 3.2. Apparatus and equipment are safely handled and stored. | * Care of apparatus, equipment and consumables by type * Storage of apparatus, equipment and consumables * Reasons for care and storage | | * Written assessment * Observation |
| 3.3. Safe  self-conduct | * The “do’s” and “don’ts”   of the laboratory | | * Observation |
| **Learning Outcome 4:** Prepare for laboratory processes quality  assurance | | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** | |
| 4.1. Prepare test plans | * Parameters to be tested in each petroleum product grade * How to condition each sample for testing * Compliance to testing specification * Statistical analysis tools * Types * Uses * Methods    | * Observation | |
| 4.2. Carry out visual  checks on the sample | * Applicable precautions * Positioning of the background light | * Observation * Questioning | |

|  |  |  |
| --- | --- | --- |
| **Learning Outcome 5:** Evaluate quality of laboratory  processes | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** |
| 5.1. Prepare  laboratory processes evaluation  materials | * Prepare the CRMs * Test the IQC sample * Confirm calibration status | * Observe * Written assessment |
| 5.2. Validate the test method | * Gather the test data * Evaluate authenticity of the test method | * Written assessment |
| 5.3. Evaluate the uncertainty | * Work out the error margins * Confirm with test method reproducibility | * Written assessment |
| 5.4. Confirm  compliance to repeatability | * Statistical analysis of the test results * Analysis of proficiency test programme results | * Written assessment |

|  |  |  |
| --- | --- | --- |
| **Learning Outcome 7:** Complete processes quality assurance | | |
| **Specific Learning**  **Outcomes** | **Content** | **Suggested Assessment**  **Methods** |
| 7.1. Confirm  quality compliance | * Conformance to repeatability/reproduci bility * Comparison of the test results with the   national specification for the grade | * Obtained comparison of the results |
| 7.2. Prepare  quality assurance reports | * Types of reports * Structure and content reports * Test methods requirements | * Written * Observation |

**Suggested Delivery Methods**

* Instructor-led facilitation of theory
* Demonstration of task by trainer
* Practice by trainee

List of Recommended Resources

|  |  |  |
| --- | --- | --- |
| **Equipment** | **Apparatus** | **Materials** |
| Distillation | Distillation flask, distillation thermometers (high and low range) | Stoppers |
| Density | Syringe, 250 ml measuring cylinders, appropriate hydrometers, density thermometers,  density measurement bath | Water |
| Flash point -Abel | Able flash point test cup,  bath, thermometers | Water |
| Flash point -PM | PM flash point test cup,  thermometers | Blotting papers |
| Copper corrosion | Copper strips, test bomb,  oil bath |  |
| Colour ASTM | Tint-meter, curettes, |  |
| Particulate matter quantification | Low-pressure suction  pump, drying oven, balance, tong or pincers |  |
| Smoke point  tester | Extractor solvent, wicks |  |
| Organoleptic test  and appearance | Sensory appeal |  |
| Existent gum | Existent gum beakers, steam generator with super heater, weighing balance, desiccator,  cleaning chemicals, detergents | Steam |
| Copper corrosion | Copper strips, test bomb,  oil bath, tong, vice | Emery cloth |
| Colour saybolt | Tint-meter, curettes |  |
| Smoke point  tester | Extractor solvent, wicks | Blotting paper |
| Particle counter | Sample delivery syringes | Blotting paper |
| Electrical  conductivity meter |  |  |
| Jet fuel thermal  oxidation test (JFTOT), | JFTOT equipment kit | Blotting paper |
| **Consumables:** | | |
| LPG, detergents, mutton cloth, blotting papers | | |
| **PPE:** | | |
| Safety shoes, gloves, dust coat, gas masks, | | |
| References | | |
| ASTM Test Method: Fossil Fuels IEC Test Method  ISO Test Methods ISO Standards | | |