FEDERAL MINISTRY OF EDUCATION

National Skills Qualifications FOR ELECTRICAL HOME APPLIANCES

LEVEL 1, 2 & 3

February, 2025

NATIONAL BOARD FOR TECHNICAL EDUCATION
NBTE

Innovation Development and Effectiveness in the Acquisition of Skills (IDEAS) Project

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National Board for Technical Education
Plot B, Bida Road, P.M.B. 2239, Kaduna, Nigeria

NATIONAL SKILLS QUALIFICATION

ELECTRICAL HOME APPLIANCES

LEVEL 1-3

FEBRUARY, 2025

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NATIONAL SKILLS QUALIFICATION

ELECTRICAL HOME APPLIANCES

LEVEL 1

FEBRUARY, 2025

Qualification: Electrical Home Appliances Maintenance

NSQ level: 1
Credit value: 20
Guided learning hours: 200

Level Purpose:
At the end of the Units, the Learner should be able to:

1. Understand the importance of Communication and Teamwork at the workplace;
2. Know basic safety and health requirements in the workplace;
3. Know the skills, knowledge, and understanding required to develop team spirit among colleagues;
4. Identify basic tools and equipment used in the maintenance of electrical home appliances;
5. Understand the concept of refrigeration;
6. Know how to check electrical faults and repairs on R & A/C;
7. Understand pipe work in R & A/C;
8. Understand Evacuation of gas in A/C system;
9. Understand basic principles and maintenance of Room heaters, Fans and Blenders;
10. Understand the components and wiring of electric cookers and microwave ovens;
11. Understand the basics of Washing Machines and Dish washers;
12. Understand the basic principles of Flat Screen TVs

Level assessment requirements/evidence requirements
There are five (5) compulsory units i.e. (unit 001, 002, 003, 004 and 005) and eight (8) optional units.

NOTE: This is a 20-credit qualification. To achieve this qualification, learners are required to achieve 13 credits from mandatory units and 3 units in the same occupational area from the 8 optional units. Each Credit is equivalent to approximately 10 Guided Learning Hours (GLH). To enable the learner to qualify for NSQ Level 1 in electrical home appliances maintenance, he must achieve 20 credit units.

The evidence required in this level includes:

1. Question and Answer (Q & A)
2. Direct Observation of the learner's performance (D.O)
3. Recognition of Prior Learning and experience (RPL)
4. Authentic statement/Witness testimony (W.T.)
5. Personal statement/reflective account (PS/RA)

NSQ LEVEL 1: ELECTRICAL HOME APPLIANCES (INSTALLATION MAINTENANCE AND REPAIRS)

Mandatory Units

S/No /Unit No	*Reference Number*	NOS Title	Credit Value	Guided Learning Hours	Remark
1	ENG/HA/001/1	**Communication System in a Work Environment**	1	10hrs	Level 1/ NSQ
2	ENG/HA/002/1	**Occupational Health and Safety**	3	30hrs	Level 1/NSQ
3	ENG/HA/003/1	**Teamwork**	1	10hrs	Level 1/ NSQ
4	ENG/HA/004/1	**Tools and Equipment (Used in Home Appliances Installation, Maintenance and Repairs)**	2	20hrs	LEVEL 1/NSQ
5	CON/RAC/008/L1	**Repairing Electrical faults, in R&AC.**	4	40hrs	Level 1/NSQ
		Total	11	110hrs	Level 1/NSQ

OPTIONAL UNIT

6	ENG/HA/005/1	**Maintenance of Water Heaters, Room Heaters and Pressing Irons**	2	20hrs	LEVEL 1 NSQ
7	ENG/HA/006/1	**Introduction to Electric Cookers and Microwave Ovens**	2	20HRS	LEVEL 1/NSQ
8	ENG/HA/007/1	**Washing Machines and Dish Washers**	2	20hrs	LEVEL 1/NSQ
9	ENG/HA/008/1	**Servicing/Repair of Fans and Blenders**	2	20hrs	LEVEL 1/NSQ
10	ENG/HA/009/1	**Servicing/Repair of Flat Screen TV**	2	20hrs	LEVEL 1/NSQ
11	CON/RAC/004/1	**Basic concept of Refrigeration and air-conditioning**	3	30hrs	Level 1/ NSQ
12	CON/RAC/005/1	**Pipe work in refrigeration and air conditioning**	3	40hrs	Level 1 NSQ
13	CON/RAC/006/1	**Evacuation and Charging in R & AC**	3	40hrs	Level 1 NSQ

NOTE: This is a 20-credit qualification, to achieve this qualification; Learners are required to achieve 13 credits from mandatory units and 7 credits from the optional units. Each Credit is equivalent to approx. 10 Guided Learning Hours (GLH). The Total Learning Hours will therefore consist of the GLH *plus* the independent learning hours of the candidate,

Unit 1: Communication System in a Work Environment

Unit reference number: ENG/HA/001/L1

NSQ level: 1

Credit value: 1

Guided learning hours: 10

Unit Purpose:
At the end of this Unit, the Learner should be able to establish a quality communication system that is responsive and subject to change in meeting workers and employers need in work environment.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below:

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria: -	Evidence Type					Evidence Ref Page number			
LO 1 ***Use a non-complex communication system in a work environment***	1.1	Use simple verbal means to pass on necessary information.									
	1.2	Use non-verbal means to pass on necessary information e.g. body language									
	1.3	Interpret symbols and signs appropriately.									
LO 2 ***Identify the source of information in a work environment***											
	2.1	Locate the source of information in an organization/work environment.									
	2.2	Relate appropriately with source of information.									
	2.3	Use the various information flow systems in a work environment.									
	2.4	Use information to avoid challenges in a work environment.									
LO 3 ***Demonstrate the use of various communication means in a work environment.***											
	3.1	Locate communication equipment in the work environment.									
	3.2	Use effectively communication equipment in a work environment.									
	3.3	Pass information effectively to the right personnel.									
	3.4	Obey instruction in line with ethics of the work environment.									

Learners Signature:	**Date:**
Assessors Signature:	Date:
IQA Signature (if sampled)	Date:
EQA Signature (if sampled)	**Date:**

Unit 2: Occupational Health and Safety

Unit reference number: **ENG/HA/002/L1**

NSQ level: **1**

Credit value: 3

Guided learning hours: 30

Unit Purpose:

At the end of this Unit, the Learner should be able to understand basic safety and health precautions, maintain personal health and hygiene to prevent hazards and deal with the hazards appropriately in the home appliances workplace.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Maintain personal health and hygiene***	1.1	Wear clean, smart and appropriate protective equipment.									
	1.2	Work safely at all times, complying with health and safety and other relevant regulations and guidelines.									
	1.3	Get any cuts, grazes and wounds treated by the appropriate person.									
	1.4	Report illness and infection promptly to the appropriate person.									
LO 2 ***Know personal health and hygiene***	2.1	State own responsibility under the health and safety Act as it relates to own occupation.									
	2.2	State general rules on hygiene that must be followed									
	2.3	State correct personal protection equipment such as Head protection, Foot protection, Face and eye protection, Hand and Body protection and regulatory protection.									
	2.4	State the importance of maintaining good personal hygiene.									
LO 3 ***Maintain a hygienic, safe and secure workplace***	3.1	Follow health, hygiene and safety procedures at the work place.									
	3.2	Practice emergency procedures at the work place.									
	3.3	Carry out work in a clean environment.									
	3.4	Follow organizational security procedures.									
LO 4 ***Prevent hazards and maintain a safe and secure workplace***	4.1	Identify any hazards or potential hazards and deal with these correctly.									
	4.2	State where information about health and safety in your workplace can be obtained.									
	4.3	Describe the types of hazards in the workplace that may occur and how to deal with them.									
	4.4	State hazards that can be dealt with personally and those that									

	should be reported to someone else									
4.5	State how to warn other people about hazards and why this is important.									
4.6	State why accidents and near accident should be reported and who they should report to.									
4.7	Describe the types of emergencies that may happen in the workplace and how to deal with them.									
4.8	State where to find the first-aid equipment in the workplace.									
4.9	State safe lifting and handling techniques that should be followed.									
4.10	State other ways of working safely that are relevant to own position and why they are important.									
4.11	Describe organizational emergencies procedures, in particular fire, and how these should be followed.									
4.12	State the possible causes of fire in the workplace.									
4.13	Describe how to minimize the possibility of fire in the workplace.									
4.14	State where to find the alarms and how to set them off.									
4.15	State why a fire should never be approached unless it is safe to do so.									
4.16	State the importance of following the fire safety rules.									
4.17	State the importance of reporting all usual or non-routine incidents to the appropriate personnel.									

Learners Signature:	**Date:**
Assessors Signature:	Date:
IQA Signature (if sampled)	Date:
EQA Signature (if sampled)	**Date:**

Unit 3: Teamwork

Unit reference number: ENG/HA/003/L1

NSQ level: **1**

Credit value: 1

Guided learning hours: 10

Unit Purpose:
At the end of this Unit, the Learner should have been impacted with the skills, knowledge and understanding required to develop team spirit in the workplace.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1.0 ***Develop positive working relationship with colleagues***	1.1	State the need for developing positive working relationship with colleagues.									
	1.2	Explain the importance of relating with other people in a way that makes them feel valued and respected.									
	1.3	Assist team members when required.									
	1.4	Report to the appropriate personnel when request for assistance fall outside area of responsibility.									
	1.5	Communicate information to colleagues about own work that might affect others.									
LO 2.0 ***Take responsibilities within the team***											
	2.1	Describe own role and responsibilities within the team.									
	2.2	Perform individual tasks in line with the team rules and regulations.									
	2.3	Participate effectively in teamwork.									
LO 3 ***Compliance with policy of organisation***											
	3.1	Work in line with organizational standards.									
	3.2	Use organizational code of conduct.									
	3.3	Explain where to find organizational rules and regulations.									

Learners Signature:	**Date:**
Assessors Signature:	Date:
IQA Signature (if sampled)	Date:
EQA Signature (if sampled)	**Date:**

Unit 4: Tools and Equipment (Used in Home Appliances Installation, Maintenance and Repairs)

Unit reference number: **ENG/HA/004/L1**

NSQ level: **1**

Credit value: 2

Guided learning hours: 20

Unit Purpose:
At the end of this Unit, the Learner should be able to identify the right tools and demonstrate proper handling of the tools used in repairs/maintenance of electrical home appliances.

Also, be able to Identify, use and maintain electrical/electronic measuring instruments effectively.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Demonstrate the Use of Tools for Electrical Home appliances***	1.1	Identify common hand tools used for Home appliances repair/maintenance.									
	1.2	Identify common power tools used for Home appliances repair/maintenance.									
	1.3	Sketch common hand tools used in Electrical Home appliances repair/maintenance.									
	1.4	Sketch common power tools used in Electrical Home appliances repair/maintenance.									
	1.5	Mention the importance of Hand and Power tools in carrying out repair/maintenance of Home appliances.									
	1.6	State the procedures for maintenance of tools.									
	1.7	Use the right tools for the right jobs.									
	1.8	Use the right power tools for the right jobs.									
LO 2 ***Demonstrate the Use and Handling of Electronics Tools/Equipment***											
	2.1	Demonstrate safe techniques in using workstation equipment.									
	2.2	Demonstrate the safe techniques of using Soldering irons and suckers.									
	2.3	Use power tools in accordance with the organizational policies and manufacturers' manual.									
	2.4	State defects that can make tools mentioned in 2.1-2.3 above unsafe for use.									
	2.5	Mention safety procedures in handling tools/equipment mentioned in 2.1-2.3 above.									
	2.6	Demonstrate maintenance of basic electronics tools.									
	2.7	Ensure safety at all times; complying with Health and Safety and other relevant regulations and guidelines.									

LO 3 ***Demonstrate the Use of Electronics Measuring Instruments***	3.1	Identify basic electrical measuring instruments.									
	3.2	Measure current, voltage and resistance of electronics simple circuit using appropriate measuring instruments.									
	3.3	Record the measurement values obtained in 3.2									
	3.4	Observe safety measures in the use of electrical measuring instruments.									
	3.5	Measure the continuity of fuse using appropriate instruments.									
LO 4: Demonstrate Maintenance of Electronics Measuring Instrument	4.1	State procedures for the maintenance of electronics measuring instruments.									
	4.2	Mention unsafe use for electronics instruments.									
	4.3	State types of maintenance on electronics measuring instruments.									
	4.4	State common faults associated with electronics measuring instruments.									
	4.5	Ensure proper calibration of electronics measuring instruments.									

Learners Signature:	**Date:**
Assessors Signature:	Date:
IQA Signature (if sampled)	Date:
EQA Signature (if sampled)	**Date:**

Unit 5: Repairing Electrical Faults in Refrigeration and Air-Conditioners

Unit Reference Number: CON/RAC/008/L1
NSQ Level: 1
Credit Value: 3

Guided Learning Hours: 30hrs

Unit Purpose: This unit is designed to equip the learner with the basic concept of repairing identified electrical faults in Refrigerators and Air-conditioners.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in a real workplace environment in which learning and human development are carried out. *Simulation is not allowed* in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS) or Reflective Practice (RP)
5. Work Product (WP)
6. Other methods are; assignments, case studies, essays, projects, etc.

LEARNING OBJECTIVE(LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.				
LO 1: ***Follow the Safety Procedure in Electrical Works***	1.1	Demonstrate safety precautions to be followed when tracing electrical faults.										
	1.2	Discuss the procedure to follow in selecting the right size of electrical wire or cable for a particular Air Conditioner (A/C).										
	1.3	Demonstrate safety precautions in replacing a faulty relay.										
	1.4	Demonstrate the procedure to follow to remove the faulty capacitors.										
	1.5	Describe safety precautions involved in replacing a faulty capacitor.										
LO 2: ***Using Tools and Equipment in R&AC Electrical works***	2.1	Measure electric supply voltage using appropriate tools/instruments.										
	2.2	Test a relay coil using appropriate tools/instruments.										
	2.3	Test the continuity of a supply cable using appropriate tools/instruments.										
	2.4	Terminate cables using appropriate materials and tools/instruments.										

LO 3: ***Replace simple*** ***Faulty Electrical Part.***	3.1	Replacing/mending a faulty electric supply cable as may be required.										
	3.2	Replace the faulty capacitor of a given fridge or A/C as appropriate.										
	3.3	Replace the relay of a given Refrigerator or A/C as appropriate.										
	3.4	Run a test of the replaced/repaired electrical part.										
LO 4: ***Test Running after Repairs in R&AC***	4.1	Describe the procedure to follow before testing the refrigerator after maintenance work.										
	4.2	Test a refrigerator after maintenance work.										
	4.3	Describe the procedure to follow before testing the Air conditioner after maintenance work.										
	4.4	Test run an Air conditioner after repairs.										
	4.5	Report findings/conditions in 4.2 and 4.4 above.										

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 6: Maintenance of Water Heaters, Room Heaters and Pressing Irons

Unit reference number: ENG/HA/005/L1

NSQ level: **1**

Credit value: **2**

Guided learning hours: **20**

Unit Purpose:
At the end of this Unit, the Learner should be able to understand the working principles of water heaters, room heaters and pressing irons and be able to carry out servicing and maintenance on them.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Know a Water Heater***	1.1	State the components found in water heaters.									
	1.2	State the function of water heater element.									
	1.3	State the function of thermostat of water heaters.									
	1.4	Carry out earth leakage test on water heater element.									
	1.5	Carry out continuity test on the element of water heaters.									
	1.6	Carry out test on the condition of water heater thermostat using appropriate instruments.									
	1.7	Document findings on above test carried out in 1.4 – 1.6 with comments on the condition of each									
LO 2 ***Know the Operation of a Room Heater***											
	2.1	List the components found in room heaters.									
	2.2	Explain the principles of operation of room heaters.									
	2.3	Carry out resistance test on the element of room heaters.									
	2.4	Use appropriate instrument to test the inductance of the fan coil of room heaters.									
	2.5	Confirm the status of the fan tested in 2.4 above.									
	2.6	Test the functionality of the thermostat of a room heater.									
	2.7	State the function of the thermostat of room heaters.									
LO 3 Know a Pressing Iron	3.1	List the components found in Pressing irons.									
	3.2	State the defect/fault in pressing iron element.									
	3.3	State the working principle of the thermostat in pressing irons.									

	3.4	Carry out continuity test on pressing iron element using appropriate instruments.									
	3.5	Describe types of fault common in pressing iron element.									
	3.6	State the size of cable used in pressing irons.									

Learners Signature:	**Date:**
Assessors Signature:	Date:
IQA Signature (if sampled)	Date:
EQA Signature (if sampled)	**Date:**

Unit 7: Introduction to Electric Cookers and Microwave Ovens

Unit reference number: **ENG/HA/006/L1**

NSQ level: **1**

Credit value: 2

Guided learning hours: 20

Unit Purpose:

At the end of this Unit, the Learner should be able to identify components in electric cookers and microwave ovens and draw electrical/electronic symbols of the components. He/she should be able to identify wiring diagrams of electric cookers and microwave ovens and be able to carry out servicing.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Identify Electrical Symbols on Electric Cookers and Microwave Ovens***	1.1	Identify signs and symbols of basic component found in electric cookers.									
	1.2	Sketch basic electrical symbols e.g. AC and DC supply etc.									
	1.3	Sketch electronic symbols of Resistors, electrolytic capacitors and diodes.									
	1.4	Sketch electrical symbols of step down transformer and accessories used in domestic installations.									
LO 2 ***Identify components in Circuit diagrams of electrical Cooker***											
	2.1	Identify cooker plate switch using the relevant circuit diagrams of electric cookers									
	2.2	Identify the cooker hot plate from the given circuit diagram.									
	2.3	Read the rating of the fuse in the circuit diagrams.									
	2.4	Name all the components from the circuit diagram									
LO 3 ***Identify components in Circuit diagrams of electrical Microwave –oven***	3.1	Identify door switch from the circuit diagram of Microwave ovens.									
	3.2	Identify the automatic sensor from the circuit diagram of microwave ovens.									
	3.3	Identify the lamp inside the microwave oven from the circuit diagram of microwave oven									
	3.4	Identify the mains switch of microwave oven from the circuit diagram.									
	3.5	Identify the control pads of microwave ovens.									
	3.6	Take reading of the rating of capacitor in microwave ovens.									

Learners Signature:	**Date:**
Assessors Signature:	Date:
IQA Signature (if sampled)	Date:
EQA Signature (if sampled)	**Date:**

Unit 8: Washing Machines and Dish Washers

Unit reference number: ENG/HA/007/L1

NSQ level: **1**

Credit value: 2

Guided learning hours: 20

Unit Purpose:

At the end of this Unit, the Learner should be able to understand the component and functions of electrical washing machines and dish washers as well as be able to perform simple task on washing machine and dish washer

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Know types of Washing Machines***	1.1	Describe types of washing machines e.g.: ➢ Manual washing machines ➢ Automatic Washing machines									
	1.2	Identify the control panel of washing machines.									
	1.3	State the function of the following timer: ➢ Washing timer ➢ Spinning timer.									
	1.4	Explain the function of drain switch.									
	1.5	Explain the type of motors used in manual washing machine.									
	1.6	State the type of motors in automatic washing machine.									
	1.6	Explain the functions of : ➢ Washing plate ➢ Washing gear ➢ Fan belt									
	1.7	Describe the function of drainage pump									
	1.8	Identify the following in an automatic washing machine: ➢ Water inlet valve ➢ Water level sensor ➢ Door switch									
	1.9	Describe the features of automatic washing machines									
LO 2 ***Know operation of Manual and Automatic Washing Machine***											
	2.1	Describe the differences between manual and automatic washing machines.									
	2.2	Explain the controls of each washing machine in 2.1 above.									
	2.3	State the common faults of door switch.									
	2.4	State the common faults of drain pump in washing machine.									
	2.5	Describe the function of timing belt.									
	2.6	State the common faults of belt of washing machines.									
	2.7	Explain the operation of programmer of washing machine.									
LO 3	3.1	Explain the procedure of servicing									

Know Servicing of a Washing Machine		the drum of washing machines.									
	3.2	Service the water inlet valve of washing machine.									
	3.3	Check belt condition in a washing machine.									
	3.4	Service the detergent dish of washing machine.									
LO: 4 ***Know Servicing of a Dish Washer***	4.1	Identify the door switch of a dish washer.									
	4.2	State the function of door switch in a dish washer.									
	4.3	Describe the function of drain pump in dish washer.									
	4.4	Service the water inlet pipe of a dish washer.									
	4.5	Locate the washing motor of a dish washer.									
	4.6	Service the soap dish of a dish washer.									
	4.7	Inspect the control panel of a dish washer for possible defect.									

Learners Signature:	**Date:**
Assessors Signature:	Date:
IQA Signature (if sampled)	Date:
EQA Signature (if sampled)	**Date:**

Unit 9: Servicing/Repair of Fans and Blenders

Unit reference number: ENG/HA/008/L1

NSQ level: **1**

Credit value: 2

Guided learning hours: 20

Unit Purpose:

At the end of this Unit, the Learner should be able to service and carry out maintenance of Fans and Blenders.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Identify Types of Fans***	1.1	State types of fans used at home.									
	1.2	State the different functions of various fans, e.g.: extractor fan, Ceiling fan, cooling fans for electronics appliances etc.									
	1.3	State the basic components of fans found in the home.									
LO 2 ***Know Operation of Fan and Safety Precaution in handling of fans***											
	2.1	State the principle of operation of a fan.									
	2.2	State the types of working voltage of fans e.g. A/C and DC.									
	2.3	Describe possible fault in all types of fans.									
	2.4	Describe the function of rotating gear of standing fans.									
	2.5	State the safety procedure in handling of fans.									
	2.6	State the precaution to take while handling fan blades.									
	2.7	State the function of a capacitor in a fan.									
LO: 3 ***Identify Components of a Blender and their Operation***	3.1	Explain the components of blenders.									
	3.2	Identify blender teeth.									
	3.3	State the function of brush in a blender.									
	3.4	Identify blender control panel.									
	3.5	Identify the armature of a blender.									
	3.6	State the function of temperature circuit breaker of a blender.									
	3.7	Locate the position of the temperature circuit breaker of a blender.									

Learners Signature:	**Date:**
Assessors Signature:	Date:
IQA Signature (if sampled	Date:
EQA Signature (if sampled)	**Date:**

Unit 10: Servicing/Repair of Flat Screen TV

Unit reference number: ENG/HA/009/L1

NSQ level: **1**

Credit value: 2

Guided learning hours: 20

Unit Purpose:

At the end of this Unit, the Learner should be able to understand various part of a flat screen television and be able to service the component of Flat screen television.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 Understand the Structure of matter and its relevance to electronics.	1.1	Define: a. Molecule b. Atom c. Electric charge d. Electric current e. Electromotive force, f. Resistance g. Coulomb									
	1.2	Explain the difference between positive and negative charges.									
	1.3	Distinguish between insulators and conductors.									
Lo: 2 ***Know the Semiconductors in electronics circuits (resistors, inductors and capacitors)***	2.1	Identify the various types and sizes of the following: a. Resistors (wire-wound, variable, fixed); b. Different types of Capacitors; c. Inductors; d. Chopper transformer									
	2.2	Describe the different connections details of the following: a. Resistors; b. Capacitors; c. Inductors.									
	2,3	State where to get the maximum working voltage temperature of a capacitor.									
	2.4	Identify the power ratings of different types of resistors.									
	2.5	Describe the colour code system for the following: a. Resistors; b. Capacitors (L2).									
	2.6	Describe the principles of operation and applications of the following semiconductor devices: a. Rectifier diode b. Zener diode c. Tunnel diode d. Light Emitting Diode (LED) e. Transistor									
LO: 3 ***Know Flat Screen Television (TV) Different Circuit Board***	3.1	Identify the power board of flat screen TV									
	3.2	Identify the sound board of flat screen TV									
	3.3	Identify the main board of flat screen TV									
	3.4	List types of flat screen TV.									
		Explain difference between the following TV sets:									

		a. Plasma b. LCD c. LED d. OLED e. QLED									
LO 4 ***Know Working Principles of Various Parts in Flat Screen TV Set***	4.1	Describe the function of the power board of flat screen TV.									
	4.2	State the function of picture board of flat screen TV.									
	4.3	Explain the use of LED in Flat screen TV.									
	4.4	State the function of sound board of flat screen TV.									
	4.5	Describe the main board of flat screen TV.									
LO 5 ***Know blocks of Printed Circuit Board (PCB) in Flat TV Set***	5.1	Locate the power board of flat screen TV.									
	5.2	Locate the picture board of a flat screen TV.									
	5.3	Locate the LED for the screen of LED TV.									
	5.4	State the difference between LED TV and LCD TV.									
	5.5	List the tools used in Repair/maintenance of Flat screen TV.									
LO: 6 ***Know Routine Servicing of Flat Screen TV Set***	6.1	Describe the safety procedure in handling flat screen TV.									
	6.2	Service the flat screen TV using the appropriate tools/equipment.									
	6.3	Carry out test using the correct tools to confirm that fuse is in good condition.									
	6.4	Describe where to get information about the TV size and power ratings.									

Learners Signature:	**Date:**
Assessors Signature:	Date:
IQA Signature (if sampled)	Date:
EQA Signature (if sampled)	**Date:**

Unit 11: Basic concept of Refrigeration and air-conditioning

Unit04: Basic concept of Refrigeration and air-conditioning

Unit Reference Number: CON/RAC/004/1

NSQ Level: **1**

Credit Value: **3**

Guided Learning Hours: **30hrs**

Unit Purpose: This unit is designed to equip the learner with basic knowledge of refrigeration and air-conditioning operational concepts.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in a real workplace environment in which learning and human development are carried out. *Simulation is not allowed* in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS) or Reflective Practice (RP)
5. Other methods, assignments, case studies, essays, projects etc.

LEARNING OBJECTIVE(LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref.PageNo.				
LO 1: ***Know the basic concept of refrigeration***	1.1	Explain refrigeration.										
	1.2	List types of refrigeration systems.										
	1.3	Explain the classification of refrigeration.										
	1.4	Define vapour compression system.										
	1.5	Explain how the vapour compression system works.										
	1.6	Sketch the schematic diagram of the vapour compression system.										
LO 2: ***Know the basic terms of Air-conditioning***	2.1	Define an air-conditioning system.										
	2.2	Describe types of air-conditioning systems.										
	2.3	Explain the working principles of domestic Air-Conditioning system.										
	2.4	Sketch the schematic diagram of the domestic air-conditioning system.										
	2.5	Identify the major components of a domestic air-conditioning system.										
LO 3: ***Know basic knowledge of refrigerant.***	3.1	Define a refrigerant.										
	3.2	List the types of refrigerant.										
	3.3	Explain the coding of refrigerants.										
	3.4	Identify refrigerants according to colour coding.										
	3.5	Explain refrigerants according to the number of codes.										
	3.6	State properties of a refrigerant.										
LO 4: ***Know career opportunities in refrigeration***	4.1	Identify job opportunities in refrigeration and air-conditioning.										
	4.2	State the types of job specialties in Refrigeration and air-conditioning:										

and air-conditioning	4.3	Explain the job specifications of the following specialties in refrigeration and air-conditioning: • Sales Engineer; • Application Engineer; • Maintenance Technicians; • Sheet Metal Experts; • Installers; • Oxy-acetylene Welding expert (Pipe Work expert)									
LO 5: ***Outline the Materials used in the fabrication of refrigeration parts.***	5.1	Identify types of materials used for external body framework of refrigerators.									
	5.2	Describe the types of materials used as Insulator in refrigerator.									
	5.3	Explain the types of materials used for the internal body framework of our refrigerators.									
	5.3	Define compressor in the refrigeration system.									
	5.2	Define condensers in the refrigeration system.									
	5.3	Define evaporators in refrigeration System.									
	5.4	Explain the types of pipes used in evaporators and condensers units of refrigerators.									
	5.5	Distinguish between pipes used in evaporators and condenser units of refrigerators.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 12: Pipe works in refrigeration and air-conditioning

Unit Reference Number: CON/RAC/005/L1
NSQ Level: 1
Credit Value: 3

Guided Learning Hours: 30hrs

Unit Purpose: The purpose of this unit is to equip the learner with the concept and practical application of Pipework in refrigeration

Unit assessment requirements /evidence requirements:

Assessment must be carried out in a real workplace environment in which learning and human development are carried out. *Simulation is not allowed* in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS) or Reflective Practice (RP)
5. Work Product (WP)
6. Other methods; assignments, case study, essay, project etc.

LEARNING OBJECTIVE(LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.				
LO 1: ***Know various types of pipes used in refrigeration and air-Conditioning***	1.1	Identify types of pipes used in Refrigeration and air-conditioning										
	1.2	Select pipes using the diameter as Parameter.										
	1.3	Select pipes based on functionality as a parameter.										
	1.4	Select pipes based on material as a parameter.										
LO 2: ***Know pipe-cutting and bending operations in refrigeration and air-conditioning.***	2.1	Explain the types of tools used in the pipe-cutting operations.										
	2.2	Apply safety precautions associated with pipe-cutting operations.										
	2.3	Describe different methods of pipe-cutting operations.										
	2.4	Select appropriate tools for pipe-cutting operations.										
	2.5	Carry out pipe-cutting operations.										
	2.6	Apply safety precautions associated with pipe bending operations.										
	2.7	Describe the process of pipe bending using different methods										
	2.8	Select appropriate tools for pipe-bending operations.										
	2.8	Carry out pipe-bending operation										
Lo 3: ***Apply Flaring Operation***	3.2	Apply safety precautions associated with pipe flaring.										
	3.1	Identify tools and equipment used in pipe flaring.										
	3.3	Describe the process of pipe flaring.										
Lo 4: ***Apply Swaging Operation***	4.1	Identify tools and equipment used in swaging operations.										
	4.2	Apply safety precautions associated with swaging operations.										
	4.3	Describe the procedure followed in the pipe swaging operation.										

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 13: Evacuating and Charging in R & AC

Unit Reference Number: CON/RAC/006/L1 NVQF
Level: 1
Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: Demonstrate the basic concept and procedure of evacuation and Charging in refrigeration and air conditioning systems.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in a real workplace environment in which learning and human development are carried out. *Simulation is not allowed* in this unit and level.
Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Practical Assessment (PA)
4. Witness Testimony (WT)
5. Personal statement (PS)or Reflective Practice (RP)
6. Work Product (WP)
7. Other methods are; assignments, case studies, essays, projects etc.

LEARNING OBJECTIVE(LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: ***Understand Safety Procedures in Evacuation and Charging of Refrigerant***	1.1	Explain the evacuation and charging of refrigerants.									
	1.2	Identify the safety procedures in evacuation and charging processes.									
	1.3	Identify the PPE used in evacuation and charging operations.									
	1.4	Apply safety precautions involved in the evacuation and charging of refrigerant from the refrigeration systems.									
LO 2: ***Identify tools and Equipment used in evacuation and Charging Work.***	2.1	Identify tools and equipment used for the evacuation of unwanted particles in Refrigeration systems.									
	2.2	Describe the function of each tool/equipment identified in 2.1 above									
	2.3	Identify tools and equipment used in Charging refrigerators.									
	2.4	Identify refrigerant types according to codes									
	2.5	State the difference in the materials identified in 2.4 above.									
LO 3: ***Describe the functions of Equipment used in Evacuation.***	3.1	Describe the functions of vacuum pump.									
	3.2	Describe the functions of a manifold gauge.									
	3.3	Describe the correct setting of the vacuum process.									
	3.4	Perform evacuation process in Refrigerators.									
LO 4: ***Demonstrate the process of Charging a Refrigerator***	4.1	Describe the procedure of selecting refrigerant for a particular refrigerator.									
	4.2	Select tools/equipment to charge a refrigerator.									
	4.2	Prepare to charge a refrigerator.									
	4.3	Demonstrate the charging process in a refrigerator.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

NATIONAL SKILLS QUALIFICATION

ELECTRICAL HOME APPLIANCES

LEVEL 2

FEBRUARY, 2025

Qualification: Electrical Home Appliances Maintenance

NSQ level: **2**

Credit value: 28

Guided learning hours: **280**

Level Purpose:

At the end of the Units, the Learner should be able to:

1. Understand the importance of Communication and Team-work at the workplace;
2. Know basic safety and health requirements in a workplace;
3. Know and Install Air-conditioner systems in a building as well as the its maintenance and repairs;
4. Carryout Maintenance and repairs of all types of Fans and Blenders in accordance with the IEE regulations regarding;
5. Carryout maintenance and repairs of washing machine and dish washer using appropriate tools and instrument;
6. Carry out maintenance and repairs of electric cooker and microwave;
7. Carryout various installation, maintenance and repairs of Flat Screen Television set;
8. Understand the electrical safety fundamentals in home appliances;

Level assessment requirements/evidence requirements

There are six (6) compulsory units (i.e. units 1,2,3,4, 5 and 6) and any other three (3) units out of the other seven (7) optional units in this level to enable the learner qualify for NSQ Level 2 in electrical home appliances installation and maintenance.

The evidence required in this level includes:

1. Questioning (Oral Q & A)
2. Direct Observation of the learner's performance (D.O.)
3. Assignment (Written Question and Answer)
4. Recognition of Prior Learning and (RPL)
5. Witness testimony (W.T.)
6. Personal statement/reflective account. (P.S./R.A.)
7. Product of the learners work. (WP)

Mandatory Units

S/No /Unit No	Reference Number	NOS Title	Credit Value	Guided Learning Hours	Remark
1	ENG/HA/001/L2	**Communication System in a Work Environment**	2	20hrs	Level 2/ NSQ
2	ENG/HA/002/L2	**Occupational Health and Safety**	2	20hrs	Level 2/NSQ
3	ENG/HA/003/L2	**Teamwork**	1	10hrs	Level 2/ NSQ
4	ENG/HA/004/L2	**Application of Tools and Equipment (Used in Home Appliances Installation, Maintenance and Repairs)**	3	30hrs	LEVEL 2/NSQ
5	ENG/HA/005/L2	**Electrical Safety and Fundamentals**	2	20hrs	LEVEL 2/NSQ
6	CON/RAC/006/L2	**Diagnosing and Repairing Electrical faults in R & AC.**	4	40hrs	Level 2/NSQ
	Total		16	160	Level 2/NSQ

OPTIONAL UNIT

7	ENG/HA/007/L2	**Servicing of water heaters, room heaters and pressing iron**	4	40hrs	Level 2 NSQ
8	ENG/HA/008/L2	**Maintenance of Electric Cooker and Microwave Ovens**	3	30hrs	Level 2 NSQ
9	ENG/HA/009/L2	**Maintenance Washing Machines and Dish Washers**	4	40hrs	Level 2 NSQ
10	ENG/HA/010/L2	**Maintenance of Fans and Blenders**	3	30hrs	Level 2 NSQ
11	ENG/HA/011/L2	**Maintenance of Flat Screen TV**	4	40hrs	LEVEL 2 NSQ
12	*CON/RAC/007/2*	**Troubleshooting in Refrigeration and Air-Conditioner**	*4*	40HRS	LEVEL 2/NSQ
13	*CON/RAC/008/2*	**Oxy-acetylene Welding Work in R&AC**	*6*	60hrs	LEVEL 2/NSQ
14	*CON/RAC/009/2*	**Installation and Maintenance of Domestic air conditioner**	*6*	60hrs	LEVEL 2/NSQ

Unit 1: Communication System and Customer Service in Work Environment

Unit reference number: ENG/HA/001/L2

NSQ level: 2

Credit value: 2

Guided learning hours: 20

Unit Purpose:
At the end of this Unit, the Learner should be able to establish a quality service to customer and communication system that is responsive and subject to change in meeting workers and employers need in work environment.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Use non-complex communication system in a work environment***	1.1	Use simple verbal means to pass on necessary information.									
	1.2	Use non-verbal means to pass on necessary information e.g. body language									
	1.3	Interpret symbols and signs appropriately.									
	1.4	Communicate with subordinate effectively.									
LO 2 ***Identify the source of information in a work environment***											
	2.1	Locate the source of information in an organization and work environment.									
	2.2	Relate appropriately with source of information.									
	2.3	Use the various information flow systems in a work environment.									
	2.4	Use information to avoid challenges in a work situation.									
	2.5	Report findings in accordance with procedure in a work environment.									
LO 3 ***Use of various communication means in a work environment.***											
	3.1	Locate the various communication equipment in the work environment.									
	3.2	Use effectively the various communication equipment in a work environment.									
	3.3	Pass information effectively using symbols, signs and codes.									
	3.4	Pass information effectively to the right personnel.									
	3.5	Obey instruction in line with ethics of the work environment.									
LO 4 ***Relate with Customer***											
	4.1	Categorize customers.									
	4.2	Identify own role in dealing with customer.									
	4.3	Relate with the customer									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 2: Occupational Health and Safety

Unit reference number: ENG/HA/002/L2

NSQ level: **2**

Credit value: 2

Guided learning hours: 20

Unit Purpose:

At the end of this Unit, the Learner should be able to understand basic safety and health precautions and maintain personal health and hygiene to prevent hazards and deal with one appropriately in the workplace.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment (Question and Answer)
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Maintain personal health and hygiene***	1.1	Wear clean, smart and appropriate protective equipment.									
	1.2	Work safely at all times, complying with health and safety and other relevant regulations and guidelines.									
	1.3	Get any cuts, grazes and wounds treated by the appropriate person.									
	1.4	Report illness and infection promptly to the appropriate person.									
LO 2 ***Understand the Rules in maintaining personal health and hygiene***											
	2.1	State own responsibility under the health and safety Act as ~~it~~ relates to own occupation									
	2.2	State general rules on hygiene that must be followed									
	2.3	State correct personal protection equipment such as Head protection, Foot protection, Face and eye protection, Hand and Body protection and regulatory provision									
	2.4	State the importance of maintaining good personal hygiene									
LO 3 ***Help maintain a hygienic, safe and secure workplace***	3.1	Follow health, hygiene and safety procedure work place									
	3.2	Practice emergency procedures at work place									
	3.3	Follow organizational security procedures									
	3.4	Wear right protective equipment for right job to avoid accident in the workshop.									
LO 4 P***revent hazards and maintain safe and secure work place***	4.1	Identify any hazard~~s~~ or potential hazard~~s~~ and deal with these correctly									
	4.2	State where information about health and safety in your workplace can be obtained									
	~~4.3~~	State hazards that can be dealt with personally and those that should be reported appropriate authority									
	4.4	State how to warn others about hazards and why this is important									
	4.5	State why accidents and near accident should be reported and who									

	they should be reported to									
4.6	Describe the types of emergencies that may happen in the workplace and how to deal with them									
4.7	State where to find the first-aid equipment and who the registered first-aider is in the workplace									
4.8	State safe lifting and handling techniques that should be followed.									
4.9	Describe organizational emergencies procedures, in particular fire, and how these should be followed									
4.10	State the possible causes for fire in the workplace.									
4.11	Describe how to minimize the possibility of fire in the workplace									
4.12	State where to find the alarms and how to set them off.									
4.13	State the importance of following the fire safety rules.									
4.14	State the importance of reporting all usual or non-routine incidents to the appropriate personnel.									
4.15	Describe safe way of handling ladders, scaffold in jobs that involve climbing.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 3: Teamwork

Unit reference number: ENG/HA/003/L2

NSQ level: 2

Credit value: 1

Guided learning hours: 10
Unit Purpose:

At the end of this Unit, the Learner should have been impacted with the skills, knowledge and understanding required to develop team spirit in the workplace.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning (Oral Q&A)
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment (Question and Answer)
6. Personal statement (PS)/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1.0 ***Demonstrate Positive working relationship with colleagues***	1.1	Identify the need for developing positive working relationship with colleagues.									
	1.2	Recognize the importance of relating with others in a way that makes them feel valued and respected.									
	1.3	Assist team members when required.									
	1.4	Report to the appropriate personnel when request for assistance fall outside area of responsibility.									
	1.5	Communicate information to colleagues about own work that might affect others.									
LO 2.0 ***Take responsibilities within the team***											
	2.1	Recognize own role and responsibilities within the team.									
	2.2	Perform individual tasks in line with the team rules and regulations.									
	2.3	Participate effectively in teamwork.									
LO 3.0 ***Compliance with policy of organisation***											
	3.1	Work in line with organizational standards.									
	3.2	Use organizational code of conduct.									
	3.3	Communicate information to colleagues in compliance with policy of the organization.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 4: Application of Tools and Equipment (Used in Home Appliances Installation Maintenance and Repairs)

Unit reference number: ENG/HA/004/L2

NSQ level: **2**

Credit value: 3

Guided learning hours: 30

Unit Purpose:
At the end of this Unit, the Learner should be able to carry out application of tools used in servicing electrical Home appliances, testing of such appliances using appropriate testing instruments.

Unit assessment requirements/evidence requirements

The unit requires the various assessment methods below;

1. Questioning
2. Direct Observation of the learner's performance
3. Recognition of Prior Learning and experience
4. Assignment (Question and Answer)
5. Witness testimony
6. Personal statement/reflective account.
7. Product of the learners work.

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 Demonstrate the Use of Electrical Home Appliances Tools/Equipment	1.1	Use appropriate hand tools to lose an appliance.									
	1.2	Demonstrate the use of power tools used in home appliance maintenance.									
	1.3	Differentiate between power tools and hand tools.									
	1.4	Explain the procedure of maintaining of tools.									
	1.5	Use appropriate tools for the right job.									
LO: 2 ***Application and maintenance of Tools in Home Appliances***	2.1	Use workstation to remove a component from the PC board.									
	2.2	Solder some component on PC board using the appropriate tools.									
	2.3	Soak and remove a component from the board.									
	2.4	Discuss the advantages of maintaining tools in line with the regulations.									
	2.5	Explain the safety procedure in the use of hand and power tools.									
LO 3 ***Application of Measuring Instrument in Home Appliances Work***											
	3.1	Measure supply voltage using appropriate instrument.									
	3.2	Take current reading of an appliances using appropriate instrument.									
	3.3	Determine the value of a resistor using the appropriate instrument.									
	3.4	Confirm the condition of a given Capacitor.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 5: Electrical Safety and Fundamentals

Unit reference number: ENG/HA/005/L2

NSQ level: 2

Credit value: 2

Guided learning hours: 20

Unit Purpose:

At the end of this Unit, the Learner should be able to understand the purpose and use of protective devices in electrical installation.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Direct Observation of the learner's performance
3. Recognition of Prior Learning and experience
4. Assignments
5. Authentic statement/Witness testimony
6. Personal statement/reflective account.
7. Product of the learners work.

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Observe Electrical Safety Principles and Practice***	1.1	Identify basic protective devices used in electrical installations.									
	1.2	Locate protective devices in electrical installation.									
	1.3	Select the appropriate size and type of protective devices for a particular installation.									
	1.4	Identify causes of abnormal conditions in electrical installations.									
	1.5	Operate the protective devices in accordance with approved procedures and regulations.									
	1.6	Sketch the symbols of protective devices in electrical installation.									
LO 2 ***Identify Electrical Hazards and Risks***											
	2.1	Identify different methods of protecting electrical installations.									
	2.2	Outline the uses of protective devices in electrical installations.									
	2.3	Mention the advantages and disadvantages of each protective device.									
	2.4	Identifying the current ratings of the protective devices used in electrical installation and equipment.									
LO 3 ***Installation/Maintenance Activity on Electrical Circuits***	3.1	Recognize the appropriate regulations for the determination of the various sizes and types of protective devices.									
	3.2	Carry out the installation activities of protective devices in accordance with safe working practices.									
	3.3	Determine current rating of fuses and other protective devices.									
	3.4	Differentiate between current operated and voltage operated earth leakage circuit breakers.									
	3.5	Carry out fault finding and repairs of protective devices in electrical installation.									
L O 4 ***Apply Electrical Safety Principles to Home***	4.1	Test the operation of protective devices in an installation.									

Appliances Repairs											
	4.2	Distinguish between the operation of a fuse and a miniature circuit breaker (MCB).									
	4.3	Demonstrate the operation of an Earth Leakage Circuit Breaker (ELCB)									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 6: Diagnosing and Repairing Electrical faults in R & AC

Unit Reference Number: CON/RAC/006/L2

NSQ Level: **2**
Credit Value: **3**

Guided Learning Hours: **30hrs**

Unit Purpose: This unit is designed to equip the learner with the basic concept of diagnosing electrical faults in Refrigerators and Air-conditioners, tools/equipment used and safety procedures in diagnoses of electrical faults.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in a real workplace environment in which learning and human development are carried out. *Simulation is not allowed* in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS) or Reflective Practice (RP)
5. Work Product (WP)
6. Other methods are; assignments, case studies, essays, projects, etc.

LEARNING OBJECTIVE(LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.				
LO 1: Safely Diagnosing and Repairing Electrical Faults in R&AC	1.1	Explain safety precautions to be followed when tracing and repairing electrical faults.										
	1.2	Explain the procedure to follow in selecting the right size of cable for a particular Air Conditioners.										
	1.3	Describe the safety precautions to be followed when replacing a faulty relay.										
	1.4	Identify a faulty capacitor.										
	1.5	Perform the replacement of a faulty capacitor.										
LO 2: Use Tools/ Equipment used in R&AC Electrical works	2.1	Use appropriate tools/instruments for measuring electric current and voltage.										
	2.2	Use appropriate tools/instruments for testing the relay coil.										
	2.3	Use the instrument in the continuity test of a cable.										
	2.4	Use the equipment/instrument for cable joining and termination.										
LO 3: Troubleshooting of Electrical Faults in R&AC	3.1	Repair the fault of the compressor fan not starting while the compressor unit is starting.										
	3.2	Repair the fault of the overload clicking sound and the compressor not starting.										
	3.3	Repair the fault of the overload starts relay and capacitors.										
	3.4	Repair the power supply fault in the Air-conditioner unit, and cut-offs.										
LO 4: Replace Faulty Electrical Parts in R&AC	4.1	Carry out a replacement or mending of a faulty electric cord wire										
	4.2	Remove a faulty electrical part and replace it with a functioning one.										
	4.3	Repair an overload relay and/or replace it with a new functioning one.										
	4.4	Test-running the refrigerator after repairs										

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 7: Servicing of Water Heaters, Room Heaters and Pressing Irons

Unit reference number: ENG/HA/007/L2

NSQ level: **2**

Credit value: 3

Guided learning hours: 30

Unit Purpose:

At the end of this Unit, the Learner should be able to carry out maintenance and repairs of fault associated with water heaters, room heaters and pressing irons and be able to carry out replacement of faulty components.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;
1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Personal statement/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1	1.1	Describe the components found in water heaters									
Water Heater	1.2	Explain the types of water heater elements.									
	1.3	State the principles of operation of thermostat of water heaters									
	1.4	Perform earth leakage test on water heater element and record result									
	1.5	Carry out test on the condition of water heater thermostat using appropriate instruments.									
	1.6	Explain findings on above test carried out in 1.4 – 1.5 with comment on the condition of each									
LO 2											
Maintaining Room Heater	2.1	Discuss the components found in room heaters.									
	2.2	Describe the principles of operation of room heaters.									
	2.3	Carry out resistance test on the element of room heaters.									
	2.4	Test the inductance of the fan coil of room heaters.									
	2.5	Test functionality of the thermostat of a room heaters.									
	2.6	Replace faulty thermostat of room heaters.									
LO 3	3.1	Describe the components found in pressing irons.									
Maintenance and Repairs of Pressing Iron	3.2	Trouble shoots the fault of element in a given pressing iron.									
	3.3	Set pressing iron thermostat									
	3.4	Discuss types of faults common in pressing iron element.									
	3.5	Determine the size of cable to be use for a pressing iron.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 8: Maintenance and Repairs of Electric Cookers and Microwave Ovens

Unit reference number: ENG/HA/007/L2

NSQ level: 2

Credit value: 3

Guided learning hours: 30

Unit Purpose:
At the end of this Unit, the Learner should be able to carry out maintenance and repairs of electric cooker and microwave oven, in accordance with the regulations guiding the practice.

Unit assessment requirements/evidence requirements

The unit requires the various assessment methods below;

1. Questioning
2. Direct Observation of the learner's performance
3. Recognition of Prior Learning and experience
4. Assignment (Question and Answer)
5. Authentic statement/Witness testimony
6. Personal statement/reflective account.
7. Product of the learners work.

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Wiring of Electric Cooker***	1.1	Sketch the wiring circuit of one electric cooker with one hot plate with a switch.									
	1.2	Select the right type of supply cable size to use for supply to a four burner cooker.									
	1.3	Mention the type of cable use in wiring cooker hot plate									
	1.4	Determine the current rating of the fuse in a particular Cooker									
LO 2 ***Testing of Component in Electric Cooker***											
	2.1	Carry out test to confirm the earth leakage on a cooker.									
	2.2	Test the condition of a hot plate.									
	2.3	Confirm if appropriate cables are used for a particular cooker.									
	2.4	Test the functionality of cooker switch.									
	2.5	Confirm the functionality of the indicator light in a cooker.									
	2.6	Test the functionality of thermostat switch of cooker where applicable.									
	2.7	Document findings and readings in appropriate template.									
LO 3 ***Perform Testing of Components in Microwave Oven***											
	3.1	Test the functionality of fuse of a Microwave oven.									
	3.2	State the rating of the fuse in a Microwave oven.									
	3.3	Test the continuity of the transformer coils use in Microwave oven.									
	3.4	Confirm the functionality of the capacitor in a Microwave oven.									
	3.5	Select and use appropriate tools and equipment for Microwave oven work.									
	3.6	State the process/protocol of testing the element of microwave element.									
	3.7	State the hazard in testing the element of microwave oven.									
	3.8	Confirm the functionality of the sensor in microwave oven.									
	3.9	Confirm the condition of the plate rotation motor.									
	3.1	Documents all readings and findings on appropriate template.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 9: Maintenance of Washing Machines and Dish Washers

Unit reference number: ENG/HA/009/L2

NSQ level: 2

Credit value: 4

Guided learning hours: 40

Unit Purpose:
At the end of this Unit, the Learner should be able to carry out servicing on washing machine and various maintenance and repairs task on washing machine and dish washer.

Unit assessment requirements/evidence requirements

The unit requires the various assessment methods below;

1. Questioning
2. Direct Observation of the learner's performance
3. Recognition of Prior Learning and experience
4. Assignments (Question and Answer)
5. Authentic statement/Witness testimony
6. Personal statement/reflective account.
7. Product of the learners work.

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Demonstrate tools use in Servicing Washing Machine***	1.1	Select the appropriate tools for servicing and maintenance of Washing Machine.									
	1.2	Select the appropriate tools to lose the filter of a particular washing machine									
	1.3	State the instrument use in losing the belt									
LO 2 ***Carryout the servicing of Washing Machine***											
	2.1	Remove Filter in a washing Machine using appropriate tools.									
	2.2	Remove washer plate of washing Machine using appropriate tools									
	2.3	Service the washing spinner of a washing Machine									
	2.4	Service the drainage hose of a washing machine									
	2.5	Check belt condition and record findings									
LO 3 ***Demonstrate the ability to maintain the control/control Panel of Washing Machine***											
	3.1	Explain all the functions on the control panel									
	3.2	Check for water spillage on the control panel									
	3.3	Check the functionality water level sensor in washing machine									
	3.4	Locate the sensor in Direct Drive (DD) motor									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 10: Maintenance of Fans and Blenders

Unit reference number: ENG/HA/010/L2

NSQ level: 2

Credit value: 3

Guided learning hours: 30

Unit Purpose:

At the end of this Unit, the Learner should be able to carry out servicing and maintenance and repairs of Fans and Blenders used in the home in accordance with standard safety precaution and testing to confirm the effectiveness of the appliance;

Unit assessment requirements/evidence requirements

The unit requires the various assessment materials below;

1. Questioning
2. Direct Observation of the learner's performance
3. Assignment (Question and Answer)
4. Recognition of Prior Learning and experience
5. Witness testimony
6. Personal statement/reflective account.
7. Product of the learners work.

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number				
LO 1 ***Demonstrate the use of Tools/equipment's use in Servicing, Maintenance and Repairs of Fans***	1.1	List the tools used in servicing and maintenance of fans.										
	1.2	Describe the tool use for removing the bushing of fans.										
	1.3	Use appropriate tools to lose the fan rotation gear.										
	1.4	State the instrument used for testing of fan coil resistance.										
LO 2 ***Demonstrate Maintenance and Repairs of Fan***	2.1	Identify the major components of fans.										
	2.2	Test the capacitor of a fan and document findings.										
	2.3	Carry out replacement of capacitors in a fan.										
	2.4	Identify the fan bushing and bearing.										
	2.5	Carry out replacement of fan bushing and bearing.										
	2.6	Carry out cleaning of fan bushing.										
	2.7	State the functions of rotation gear.										
LO 3 ***Demonstrate the Maintenance and Repairs of Blender***												
	3.1	Use appropriate tools to lose the casing of the blenders.										
	3.2	Explain the working principles of blenders.										
	3.3	Check the functionality of the Blender switch.										
	3.4	Replace the top Blender rubber.										
	2.5	Check the conditions of the brush in a blender and record findings.										
	2,6	Replace the brush in a blender										
	2.7	Carry out replacement of blender cup blade.										

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 11: Maintenance of Flat Screen TV

Unit reference number: ENG/HA/011/L2

NSQ level: 2

Credit value: 4

Guided learning hours: 40

Unit Purpose:
At the end of this Unit, the Learner should be able to carry out maintenance and repairs of various types of flat screen television.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Direct Observation of the learner's performance
3. Recognition of Prior Learning and experience
4. Assignment (Question and Answer)
5. Authentic statement/Witness testimony
6. Personal statement/reflective account.
7. Product of the learners work.

LO (Learning outcome)		**Criteria:-**	Evidence Type					Evidence Ref Page number			
LO 1 ***Identification of Flat Screen TV components***	1.1	Identify the Power Board of flat screen TV.									
	1.2	Identify the Sound Board of flat screen TV.									
	1.3	Identify the Main Board of flat screen TV.									
	1.4	List types of flat screen TV.									
LO 2 ***Maintenance and Repairs of Parts in Flat Screen TV Set***											
	2.1	Describe the function of the power Board of flat screen TV.									
	2.2	Trace fault in power board.									
	2.3	Replace power board.									
	2.4	State the function of Picture Board of flat screen TV.									
	2.5	Describe possible fault of picture board.									
	2.6	Carry out replacement of picture board.									
	2.7	Describe the fault with the back light of flat screen LED TV.									
	2.8	Replace the faulty back light of LED TV.									
	2.9	Explain the principles of operation of various types of flat screen TV, eg; a. LED Flat screen TV b. Plasma “ c. LCD d. OLED e. QLED									
	2.10	State the function of Sound Board in flat screen TV.									
	2.11	Explain the function of main Board of flat screen TV.									

LO 3 ***Identify Blocks of Printed Circuit Board (PCB) in Flat TV Set***	3.1	Locate the power Board of flat screen TV.								
	3.2	Locate the picture Board of a flat screen TV.								
	3.3	Locate the LED for the screen of LED TV.								
	3.4	State the difference of LED TV and Plasma TV.								
	3.5	List the tools used in repair/servicing Flat screen TV								

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 12: Troubleshooting in Refrigeration and Air-Conditioners

Unit Reference Number: CON/RAC/007/L2

NVQ Level: **2**

Credit Value: **4**

Guided Learning Hours: **40**

Unit Purpose: This unit is aimed at equipping the learner with the concept and application of Trouble Shooting and Repairs

Unit assessment requirements/evidence requirements:

Assessment must be carried out in a real workplace environment in which learning and human development are carried out. ***Simulation is not allowed*** in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS)or Reflective Practice (RP)
5. Work Product (WP)

LEARNING OBJECTIVE(LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: ***Demonstrate safety in troubleshooting and repairs of domestic Refrigeration***	1.1	Describe safety precautions involved in troubleshooting domestic refrigerators (refrigeration and air conditioning).									
	1.2	Describe safety precautions involved in repairs of domestic refrigerators.									
	1.3	Apply safety precautions involved in repairs of domestic refrigerators.									
LO 2: ***Selecting tools and equipment for troubleshooting in domestic Refrigerators***.	2.1	Identify tools and equipment used in carrying out fault diagnosis in Refrigerators.									
	2.2	Identify materials and tools for carrying out repairs of faults in refrigerators.									
	2.3	Compare the advantages and disadvantages of different methods of fault finding in refrigerators.									
	2.4	Illustrate the procedure of fault finding in domestic refrigerators.									
LO 3: ***Carry out possible faults diagnoses in domestic refrigerators.***	3.1	Trouble-shoot electrical faults in refrigerators.									
	3.2	Trouble-shoot for mechanical fault in refrigerators.									
	3.3	Trouble-shoot for leakages in refrigerators.									
	3.4	Identify causes of faults associated with domestic refrigerators.									
LO 4: ***Repair of electrical faults.***	4.1	Carry out repairs due to overload.									
	4.2	Carry out repairs on the faulty relay									
	4.3	Carry out repairs on faulty electric cords.									
	4.4	Carryout replacement of faulty capacitors.									

LO 5: ***Demonstrate the process of repairs of compressor faults***	5.1	Rectify compressor noise.									
	5.2	Carry out repairs on low pumping of compressors.									
	5.3	Carryout repairs on short-circuit fault in compressors.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

UNIT 13: Oxy-Acetylene Welding in Refrigeration and Air-conditioning

Unit Reference Number: CON/RAC/008/L2 NVQ
Level: 2

Credit Value: 3

Guided Learning: 30Hours:
Unit Purpose: This unit is aimed at equipping the learner with the concept of Oxy-Acetylene Welding in R & AC

Unit assessment requirements/evidence requirements:

Assessment must be carried out in a real workplace environment in which learning and human development are carried out. ***Simulation is not allowed*** in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS) or Reflective Practice (RP)
5. Work Product (WP)
6. Other methods (OM), assignments, case studies, essays, projects, etc.

LEARNING OBJECTIVE(LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type				Evidence Ref. Page No.			
LO 1: ***Understanding of safety in oxy-acetylene welding operations***.	1.1	Describe safety precautions involved in the movement and application of oxy-acetylene materials, e.g. hose, and gauges.								
	1.2	Explain the safety precautions involved in the storage and application of acetylene cylinder.								
	1.3	Identify hoses, and pressure gauges used with oxygen and acetylene lines.								
LO 2: ***Demonstrate the knowledge of the materials used in oxy-acetylene welding Operations.***	2.1	Explain safety measures in gas mixing and lighting of acetylene welding process.								
	2.2	Distinguish between oxygen and Acetylene cylinders.								
	2.3	Identify various parts and functions of nozzles.								
LO 3: ***Carry out oxy-acetylene welding operations***	3.1	Perform the process of releasing Acetylene from cylinders.								
	3.2	Perform the process of mixing acetylene with oxygen before the welding operation.								
	3.3	Apply the correct flame for welding operation								
	3.4	Perform the welding operation.								

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 14: Installation and Maintenance of Domestic air-conditioner

Unit Reference Number: CON/RAC/009/L2 NVQ

Level: **2**

Credit Value: **6**

Guided Learning Hours: **60hrs**

Unit Purpose: This is aimed at equipping the learner with the concept and application of Installation and Maintenance of Domestic Air-conditioning

Unit assessment requirements/evidence requirements:

Assessment must be carried out in a real workplace environment where learning and human development are carried out. ***Simulation is not allowed*** in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS) or Reflective Practice (RP)
5. Work Product (WP)
6. Other methods (OM), assignments, case studies, essays, projects, etc.

UNIT 014: Installation and Maintenance of Domestic Air-conditioners

LEARNING OBJECTIVE(LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: ***Demonstrate an understanding of safety in the installation of a domestic air-conditioning unit***	1.1	Explain the safety precautions involved in the installation of the indoor unit (Evaporator) of a domestic air-conditioner.									
	1.2	Explain the safety precautions involved in installation of the outdoor unit (Condenser/ compressor) of the domestic Air-conditioners.									
	1.3	Describe the use of personal protective equipment during the installation of a domestic split air conditioning unit.									
LO 2: ***Tools and equipment used in the installation of a domestic air-conditioning unit.***	2.1	List tools and equipment used in the installation of domestic air-conditioning units.									
	2.2	Describe specific functions of the tools used in the installation of domestic air-conditioning units.									
	2.3	Select appropriate tools and equipment for installation.									
LO 3: ***Tools and equipment used in the maintenance of a domestic air-conditioning unit***	3.1	Identify tools and equipment used in the maintenance of domestic air-conditioning units.									
	3.2	Describe specific functions of the tools used in the maintenance of domestic air-conditioning units.									
	3.3	Select appropriate tools and equipment for maintenance.									
LO 4: ***Methods of maintenance of domestic split air-conditioning unit.***	4.1	Describe methods employed in the maintenance of the outdoor section of the split air- conditioning units.									
	4.2	Describe methods employed in maintenance of the indoor section of the split air-conditioning unit.									

	4.3	Carry out maintenance using appropriate tools.									
LO 5: ***Demonstrate the process of drilling hole for the installation of domestic ac***	5.1	Select tools for drilling holes in the wall of the building before installation of air-conditioning unit									
	5.2	Describe safety measures observed in drilling the hole for the air-conditioning unit Installation									
	5.3	Carry out the drilling of holes for the installation of air-conditioning units									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

NATIONAL SKILLS QUALIFICATION

ELECTRICAL HOME APPLIANCES

LEVEL 3

FEBRUARY, 2025

Qualification: Electrical Home Appliances (Installation and Maintenance)

NSQ level: **3**

Credit value: 36

Guided learning hours: 360

Level Purpose:
At the end of the Level, the Learner should be able to:

1. Understand the importance of Customer Service Communication and Team-work at the workplace;
2. Follow basic safety and health requirements in a workplace;
3. Carry out troubleshooting and problem solving in electrical home appliances using appropriate testing instrument;
4. Carry out maintenance and repairs of Fans and Blenders;
5. Carryout complex maintenance and repairs of washing machine and dish washer;
6. Carry out fault diagnoses on electric cooker and microwave oven
7. Carry out fault diagnoses and repairs on flat screen television;
8. Carryout dismantling and assembling of Air-conditioning system;
9. Carry out testing on refrigeration compressor oil and charging;
10. Know, control devices used in refrigeration and Air-conditioning work;
11. Know the circuit diagram in refrigerator and air conditioning system;

Level assessment requirements/evidence requirements
There are five (5) compulsory units (i.e. unit 1, 2, 3, 4 and 5) and any other four (4) units on same occupation out of the other nine (9) optional units in this level to enable the learner to qualify for NSQ Level 3 in electrical home appliances installation and maintenance for a particular occupational area.

The evidence required in this level includes:

1. Questioning (Oral Q & A)
2. Direct Observation of the learner's performance (D.O.)
3. Recognition of Prior Learning and experience (RPL)
4. Assignment (written Q & A)
5. Witness testimony (W.T.)
6. Personal statement/reflective account (P.S./R.A.)
7. Product of the learners work (W.P.)
8. Professional Discussion (P.D.)

NSQ LEVEL 3: ELECTRICAL HOME APPLIANCES (INSTALLATION MAINTENANCE AND REPAIRS)

Mandatory Units

S/No /Unit No	*Reference Number*	*NOS Title*	*Credit Value*	*Guided Learning Hours*	*Remark*
1	***ENG/HA/001/3***	***Customer Service Communication***	3	30hrs	Level 3/ NSQ
2	***ENG/HA/002/3***	***Occupational Health and Safety***	3	30hrs	Level 3/NSQ
3	***ENG/HA/003/3***	***Team Work***	1	10	Level 3/NSQ
4	***ENG/HA/004/3***	***Application of Tools and Equipment (Use in Installation, Maintenance and Repairs of Home Appliances)***	3	30hrs	LEVEL 3/NSQ
5	***ENG/HA/005/3***	***Troubleshooting and Problem Solving in Home Appliances***	3	30hrs	LEVEL 3/NSQ
	Total		13	130hrs	LEVEL 3/NSQ

OPTIONAL UNIT

6	**ENG/HA/06/3**	***Maintenance and Repairs of Fans and Blenders***	6	60hrs	LEVEL 3 NSQ
7	**ENG/HA/07/3**	***Maintenance and Repairs of Electric Cookers and Microwave Ovens***	6	**60HRS**	**LEVEL 3/NSQ**
8	**ENG/HA/08/3**	***Maintenance and Repairs of Washing Machines and Dish Washers***	6	**60hrs**	**LEVEL 3/NSQ**
9	**ENG/HA/09/3**	***Maintenance and Repairs of Flat Screen TV***	6	**60hrs**	**LEVEL 3/NSQ**
10	**CON/RAC/004/3**	***Dismantle and Assemble of Air Conditioning Systems***	3	30hrs	Level 3 NSQ
11	**CON/RAC/005/3**	***Compressor Lubrication oil Charging and Testing***	2	20hrs	Level 3 NSQ
12	**CON/RAC/007/3**	***Electrical/electronic control devices in Refrigeration and Air Conditioning***	4	40hrs	Level 3 NSQ
13	**CON/RAC/008/3**	***Circuit Diagram in Refrigeration and Air Conditioning***	6	60hrs	Level 3 NSQ
14	**CON/RAC/010/3**	***Construction of Cold Rooms***	6	60hrs	Level 3 NSQ

Unit 01: Customer Service Communication

Unit reference number: ENG/HA/001/L3

NSQ level: **3**

Credit value: 3

Guided learning hours: 30

Unit Purpose:

At the end of this Unit, the Learner should be able to establish a quality communication system that is responsive to the customer and subject to change in meeting customers need in work environment.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Professional Discussion
7. Personal Statement/Reflective Account

LO (Learning outcome)	Criteria:-		Evidence Type					Evidence Ref Page number			
LO 1 ***Use a non-Complex Communication System/language to Provide Excellent customer Service and communication***	1.1	Discuss protocols of receiving customer.									
	1.2	Describe non – verbal means of communication.									
	1.3	Explain ways of obtaining customer details.									
LO 2 ***Identify Customer Needs and Expectations***											
	2.1	Take customer complaints.									
	2.2	Documents customer needs.									
	2.3	Respond to customer request.as appropriate.									
LO 3 ***Communicate Repair and Maintenance Procedure to Customer***											
	3.1	Explain procedure of repairs to customer as appropriate									
	3.2	Give appropriate time to trace fault in a given situation.									
	3.3	Explain the process of costing to customer.									
	3.4	Ensure the effective information flow to the customer.									
	3.5	Discuss time duration to repairs an item.									
	3.6	Communicate time to get feedback across to customer									
LO 4 ***Document Customer Interactions and Feedback***											
	4.1	Take customers details.									
	4.2	Document details of appliance received from customer in appropriate template.									
	4.3	Document complain in appropriate template.									
L O 5 ***Maintain and Deploy Communication Equipment***	5.1	Ensure that communication equipment are in good working condition.									
	5.2	Liaise with the maintenance unit to ensure that communication equipment are maintained regularly.									
	5.3	Liaise with appropriate authority to replace communication equipment in the event of loss or									

		damage.									
	5.4	Ensure that communication equipment's are stored appropriately in a work environment.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 02: Occupational Health and Safety

Unit reference number: ENG/HA/002/L3

NSQ level: **3**

Credit value: 3

Guided learning hours: 30

Unit Purpose:

At the end of this Unit, the Learner should be able to understand basic safety and health precautions and to maintain personal health and hygiene to prevent hazards maintain a good working environment and deal with injuries appropriately in the workplace.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment
6. Professional Discussion
7. Personal Statement/Reflective Account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Maintain personal health and hygiene***	1.1	Ensure clean, smart and appropriate protective equipment are used in the work place									
	1.2	Work safely at all times, complying with health and safety and other relevant regulations and guidelines (Nigerian factory Act for Health and Safety 2015, NIEEE Regulations, e.t.c).									
	1.3	Attend to any cuts, grazes and wounds treated by the appropriate person.									
	1.4	Attend to illness and infection promptly									
LO 2 ***Maintain personal health and hygiene***											
	2.1	Summarize own responsibility under the health and safety Act as relates to own occupation.									
	2.2	State general rules on hygiene that must be followed.									
	2.3	State correct personal protection equipment such as Head protection, Foot protection, Face and eye protection, Hand and Body protection and regulatory provisions.									
	2.4	Explain the importance of maintaining good personal hygiene.									
	2.5	Describe how to deal with cuts, bruises and wounds and why it is important to do so.									
LO 3 ***Maintain a hygienic, safe and secure workplace***	3.1	Discuss the importance of working in a healthy, safe and hygiene workplace.									
	3.2	Attend to any accidents or near accidents quickly and accurately									
	3.3	Promote health, hygiene and safety procedures at work place									
	3.4	Practice emergency procedures at work place									
	3.5	Ensure that organizational security procedures are followed.									

	3.6	Ensure the disposal of waste and pollution control with organic and inorganic waste disposal methods.									
	3.7	Promote sound and noise control using protection methods and guidelines.									
LO 4 ***Prevent hazards and maintain safe and secure work place***	4.1	Supervise identification of any hazards or potential hazards and deal with them correctly.									
	4.2	State where information about health and safety in your workplace can be obtained									
	4.3	Describe the types of hazards in the workplace that may occur and how to deal with them									
	4.4	Identify hazards that can be dealt with personally and those that should be reported to appropriate authority									
	4.5	Follow organizational procedures on how to warn others about hazards and why this is important.									
	4.6	Describe the types of emergencies that may happen in the workplace and how to deal with them.									
	4.7	Describe the use of first-aid equipment in work place									
	4.8	Describe how to Lift and handle heavy equipment in line with work environment procedure.									
	4.9	Describe organizational emergencies procedures, in particular fire and electric shock, and how these should be followed.									
	4.10	State the possible causes of fire and electric shock in the workplace.									
	4.11	Describe how to minimize the possibility of fire and electric shock in the workplace.									
	4.12	State where to find the fire alarms and how to set them off.									
	4.13	State the importance of following the fire electrical safety rules and regulations									
	4.14	Describe organizational security procedures and why they are important									

	4.15	State the importance of reporting all usual or non-routine incidents to the appropriate Authority									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 3: Team Work

Unit reference number: ENG/HA/003/L3

NSQ level: **3**

Credit value: **1**

Guided learning hours: 10

Unit Purpose:
At the end of this Unit, the Learner should have been impacted with the skills, knowledge, and understanding required to develop team spirit in the workplace.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning (Oral Q&A)
2. Observation
3. Prior Learning
4. Witness testimony
5. Assignment (Question and Answer)
6. Personal statement (PS)/Reflective account

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Demonstrate Positive working relationship with colleagues***	1.1	Discuss the importance of developing positive working relationships with colleagues.									
	1.2	Discuss the importance of relating with others in a way that makes them feel valued and respected.									
	1.3	Supervise team members when required.									
	1.4	Describe how to report to the appropriate personnel when the request for assistance fall outside area of responsibility,									
	1.5	Communicate information to colleagues about own work that might affect others.									
LO 2 ***Take responsibilities within the team***											
	2.1	Recognize own role and responsibilities within the team									
	2.2	Perform individual tasks in line with the team rules and regulations									
	2.3	Participate effectively in teamwork									
LO 3 ***Compliance with policy of organisation***											
	3.1	Work in line with organizational standards									
	3.2	Use organizational code of conduct.									
	3.3	Communicate information to colleagues in compliance with policy of the organization									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 4: Application of Tools and Equipment (Used in Home Appliances Installation Maintenance and Repairs)

Unit reference number: ENG/HA/004/L3

NSQ level: **3**

Credit value: 3

Guided learning hours: 30

Unit Purpose:
At the end of this Unit, the Learner should be able to carry out application of tools used in servicing electrical Home appliances, and testing of such appliances using appropriate testing instruments.

Unit assessment requirements/evidence requirements

The unit requires the various assessment methods below;

1. Questioning
2. Direct Observation of the learner's performance
3. Recognition of Prior Learning and experience
4. Assignment (Question and Answer)
5. Witness testimony
6. Personal statement/reflective account.
7. Product of the learners work.

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Use of Electrical Home Appliances Tools/Equipment***	1.1	Apply appropriate hand tools to lose a given appliance.									
	1.2	Use of power tools used in home appliance maintenance,									
	1.3	Describe power tools and hand tools.									
	1.4	Ensure tools and equipment are appropriately maintained.									
	1.5	Supervise the use of appropriate tools for the right job									
LO: 2 ***Application and maintenance of Tools in Home Appliances***											
	2.1	Supervise the use of workstation to remove a component from the PC board.									
	2.2	Supervise the Soldering of some component on PC board using the appropriate tools.									
	2.3	Describe the process of removing a component from the board.									
	2.4	Discuss the importance of good maintenance practice of tools and equipment.									
	2.5	Discuss the safety procedure in the use of hand and power tools.									
LO 3 ***Application of Measuring Instrument in Home Appliances Work***											
	3.1	Supervise the measurement of Supply voltage using appropriate instrument.									
	3.2	Determine the power consumption of a particular appliance.									
	3.3	State the value of a resistor using the color code.									
	3.4	Supervise the testing of status of a capacitor									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 05: Troubleshooting and Problem Solving in Home Appliances

Unit reference number: ENG/HA/005/L3

NSQ level: 3

Credit value: 3

Guided learning hours: 30

Unit Purpose:
At the end of this Unit, the Learner should be able to supervise and carry out Troubleshooting and Diagnoses of Complex Fault, Use Problem-Solving Techniques to Resolve Fault and Analyse Data and Information to Identify Root Causes of faults in electrical home appliances. Testing of such installations, troubleshooting of faults and solving problems associated with home appliances using appropriate testing instrument.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Direct Observation of the learner's performance
3. Recognition of Prior Learning and experience
4. Assignment
5. Authentic statement/Witness testimony
6. Personal statement/reflective account.
7. Product of the learners work.

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Troubleshooting and Diagnoses of Complex Faults***	1.1	Discuss causes of common complex fault with home appliances.									
	1.2	Explain how the fault in 1.1 can be avoided.									
	1.3	Explain the precaution to take in diagnoses of complex faults.									
	1.4	Discuss the equipment/tools to use in diagnoses of complex faults.									
	1.5	Describe the procedure of checking final repairs of complex faults of any home appliance before testing.									
LO 2 ***Use Problem-Solving Techniques to Resolve Fault***											
	2.1	Analyze the safety requirement on inspection of faults.									
	2.2	Supervise visual inspection of reported faults in any home appliance.									
	2.3	Discuss the effect of loosed contacts in home appliances.									
	2.4	Supervise testing of any home appliance components to trace faults.									
	2.5	Supervise replacement of bad components on any appliance.									
LO 3 ***Analyse Data and Information to Identify Root Causes***											
	3.1	Supervise the use of circuit diagrams to analyze manufacturers specifications on any home appliance.									
	3.2	Discuss where to find manufacturer's specifications of home appliance									
	3.3	Discuss process of sourcing of parts to maintain home appliances.									
	3.4	Supervise the process of testing the functionality of new parts purchased before replacement.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 06: Maintenance and Repairs of Fans and Blenders

Unit reference number: ENG/HA/006/L3

NSQ level: 3

Credit value: 6

Guided learning hours: 60

Unit Purpose:

At the end of this Unit, the Learner should be able to select and carryout servicing and maintenance of fan and blender systems used in the home in accordance with standard safety precaution and testing to confirm the effectiveness of the systems and components.

Unit assessment requirements/evidence requirements

The unit requires the various assessment materials below:

1. Questioning
2. Direct Observation of the learner's performance
3. Assignment (Question and Answer)
4. Recognition of Prior Learning and experience
5. Witness testimony
6. Personal statement/reflective account.
7. Product of the learners work.

Unit 06: Maintenance and Repairs of Fans and Blenders

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Use of Tools/ equipment to Maintain/Repair Fans***	1.1	Select the relevant tools used in maintenance and repairs of fans									
	1.2	Remove the bushing of a given fan using appropriate tools.									
	1.3	Replace fan rotation gears.									
	1.4	Test fan coil resistance using the appropriate instruments,									
LO 2 ***Maintenance and Repairs of Fans***	2.1	Describe the major components of fans.									
	2.2	Replace the capacitor of a Fan.									
	2.3	Describe common faults with fan bushing.									
	2.4	Diagnose problem of fan coil.									
LO 3 ***Carry out the Maintenance and Repairs of Blenders***											
	3.1	Supervise the use of appropriate tool to lose the casing of the blenders.									
	3.2	Describe the working principles of blenders.									
	3.3	Test the functionality of the Blender switch.									
	3.4	Supervise the replacement of the top blender rubber									
	2.5	Supervise the replacement of the brush in a blender using appropriate tools.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 07: Maintenance and Repairs of Electric Cookers and Microwave Ovens

Unit reference number: ENG/HA/007/L3

NSQ level: 3

Credit value: 6

Guided learning hours: 60

Unit Purpose:

At the end of this Unit, the Learner should be able to carry out maintenance and repairs of Electric cooker and microwave oven.

Unit assessment requirements/evidence requirements
The unit requires the various assessment methods below;

1. Questioning
2. Direct Observation of the learner's performance
3. Recognition of Prior Learning and experience
4. Assignment (Question and Answer)
5. Authentic statement/Witness testimony
6. Personal statement/reflective account.
7. Product of the learner's work.

Unit 07: Maintenance and Repairs of Electric Cooker and Microwave Oven

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Know the Wiring System of Electric Cooker***	1.1	Supervise the sketched wiring circuit of one electric hot plate with a switch.									
	1.2	Determine the right type of supply cable to use for a four-burner cooker.									
	1.3	Explain the type of cables used in wiring cooker hot plate									
	1.4	Calculate the value of the fuse in a given cooker									
LO 2 ***Testing of Component in Electric Cooker***	2.1	Supervise test to confirm the earth leakage on a cooker.									
	2.2	Confirm the condition of a hot plate.									
	2.3	Ensure appropriate cables are used for a particular cooker.									
	2.4	Describe the functionality of cooker switch.									
	2.5	Test the functionality of the indicator light in a cooker.									
	2.6	Supervise the test on the functionality of thermostat switch of cooker where applicable.									
	2.7	Check documented findings and readings in appropriate template.									
LO 3 ***Perform Testing of Components in Microwave Oven***											
	3.1	Check the functionality of the fuse in a Microwave oven.									
	3.2	Determine the rating of the fuse in a Microwave oven.									
	3.3	Supervise the continuity test of the transformer coils used in Microwave ovens.									
	3.4	Discuss the functionality of the capacitor in a Microwave oven.									
	3.5	Ensure the use of appropriate tools and equipment for Microwave oven work.									
	3.6	Explain the process/protocol of testing the element of microwave element.									
	3.7	Explain hazards in testing the element of microwave oven.									

	3.8	Diagnose the functionality of the sensors in microwave ovens.									
	3.9	Describe the conditions of the plate rotation motors.									
	3.10	Check that the readings and findings are documented on an appropriate template.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 8: Maintenance and Repairs of Washing Machine and Dish Washer

Unit reference number: ENG/HA/08/L3

NSQ level: 3

Credit value: 6

Guided learning hours: 60

Unit Purpose:
At the end of this Unit, the Learner should be able to carry out maintenance and repairs of washing machine and dish washer.

Unit assessment requirements/evidence requirements

The unit requires the various assessment methods below;

1. Questioning
2. Direct Observation of the learner's performance
3. Recognition of Prior Learning and experience
4. Assignments (Question and Answer)
5. Authentic statement/Witness testimony
6. Personal statement/reflective account.
7. Product of the learners work.

Unit 8: Maintenance and Repairs of Washing Machine and Dish Washer

LO (Learning outcome)		Criteria:-	Evidence Type					Evidence Ref Page number			
LO 1 ***Use Appropriate Tools to Servicing Washing Machine***	1.1	Use the required tools for servicing and maintenance of Washing Machine.									
	1.2	Supervise the use of appropriate tools to lose the filter of a particular washing machine									
	1.3	Describe the instrument use in losing the belt									
LO 2 ***Demonstrate the servicing of Washing Machine***											
	2.1	Supervise the removal of Filter in a washing Machine using appropriate tools.									
	2.2	Describe how to loose washer plate of washing Machine using appropriate tools									
	2.3	Discuss how to service the washing spinner of a washing Machine									
	2.4	Replace the drainage hose of a washing machine									
	2.5	Confirm belt condition and the recorded findings									
LO 3 ***Demonstrate the ability to maintain the control/control Panel of Washing Machine***											
	3.1	Describe all the functions on the control panel									
	3.2	Inspect for water spillage on the control panel									
	3.3	Diagnose the functionality of water level sensor in washing machine									
	3.4	Check the functionality of the sensor in Direct Drive (DD) motor									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 9: Maintenance and Repairs of Flat Screen Television (TV)

Unit reference number: ENG/HA/09/L3

NSQ level: 3

Credit value: 6

Guided learning hours: 60

Unit Purpose:

At the end of this Unit, the Learner should be able to carry out maintenance and repairs of various type of flat screen television.

Unit assessment requirements/evidence requirements

The unit requires the various assessment methods below;

1. Questioning
2. Direct Observation of the learner's performance
3. Recognition of Prior Learning and experience
4. Assignment (Question and Answer)
5. Authentic statement/Witness testimony
6. Personal statement/reflective account.
7. Product of the learners work.

LO (Learning outcome)	Criteria:-		Evidence Type					Evidence Ref Page number			
LO 1 ***Locating Components of Flat Screen TV***	1.1	Check the power board of flat screen TV.									
	1.2	Describe how to remove the sound board of flat screen TV.									
	1.3	State the functions of the main board of flat screen TV.									
	1.4	Discuss the different types of flat screen TV.									
LO 2 ***Diagnosis of Parts in Flat Screen TV Set***											
	2.1	Explain the function of the power board of flat screen TV.									
	2.2	Trace the fault of rectifier in the power board.									
	2.3	Describe common fault in the picture board of flat screen TV.									
	2.4	Supervise the replacement of back light of an LED TV.									
	2.5	Diagnose problem of poor sound in flat screen TV.									
	2.6	Discuss the common problem of main board of flat screen TV.									
	2.7	Supervise the replacement of picture board.									
	2.8	Discuss the major differences in the operation between LED, OLED and QLED.									
	2.9	Describe handling of flat screen TV to avoid breaking of the screen.									
	2.9	Describe how to replace flat Screen TV using appropriate tools.									
LO 3 ***Blocks of Printed Circuit Board (PCB) in Flat TV Set***											
	3.1	Supervise how to remove the power Board of flat screen TV.									
	3.2	Describe the functions of semiconductors in picture Board of a flat screen TV.									
	3.3	Describe the process of tracing/removing the LED for the screen of LED TV.									
	3.4	Describe the difference between the main board of LED TV and Plasma TV.									

	3.5	Describe the tools used in repairs of Flat screen TV.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 10: Dismantle and Assemble of Air-Conditioning System

Unit Reference Number: CON/RAC/004/3

NSQ Level:	**3**
Credit Value:	**3**
Guided Learning Hours:	**30**

Unit Purpose:

This unit is aimed to impact the leaner, with the necessary knowledge and skills required to dismantle and assemble an air-conditioning system.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in a real workplace environment where learning and human development are carried out. **Simulation is not allowed** in this unit and level.

Assessment methods to be used include:

1. Direct observation (DO)
2. Written/Oral Question and Answer (QA).
3. Personal Statement
4. Work Product (WP)
5. Professional Discussion (PD)
6. Assignment

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO1: ***Understand dismantling an air-conditioning unit***	1.1	Identify tools and equipment for dismantling operation.									
	1.2	Demonstrate the procedure for the dismantling of the Air-conditioning systems.									
	1.3	Describe the safety measures to take while dismantling the Air-conditioners.									
	1.4	Discuss how to recycle refrigerant properly.									
	1.5	Discuss how to service the different parts of the Air-conditioner after dismantling.									
LO2: ***Partial dismantling of an air-conditioning system***	2.1	Explain partial dismantling.									
	2.2	Identify the reason for the partial dismantling of the Air-conditioning system.									
	2.3	Identify the components to be dismantled for partial dismantling in air –conditioning system.									
LO3: ***Assembling of an air – conditioning system***	3.1	Explain safety precautions associated with assembling of air-conditioning system									
	3.2	Assemble four major components of Air-conditioning system i.e compressor, condenser, expansion valve, and evaporator.									
	3.3	Describe the steps to follow for assembling an air conditioning.									
	3.4	Verify the wiring connections of the assembled air conditioning									
	3.6	Explain the laid down procedures to safeguard self, others and the environment.									
LO4: ***Carry out post-assembling tests in refrigeration and air-conditioning***	4.1	Check for leaks in all pipe connections.									
	4.2	Test – run the assembled components.									
	4.3	Confirm if there are leakages,									
	4.4	Inspect the operational condition and record findings									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 11: Compressor Lubrication Oil Charging and Testing

Unit Reference Number: CON/RAC/005/3

NSQ Level:	**3**
Credit Value:	**3**
Guided Learning Hours:	**30**

Unit Purpose:

This unit is aimed to impact the learners, with the necessary knowledge and skills required for Compressor Lubrication Oil Charging and Testing of air-conditioning systems.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in a real workplace environment in which learning and human development are carried out. **Simulation is not allowed** in this unit and level.

Assessment methods to be used include:

1. Direct observation (DO)
2. Written/Oral Question and Answer (QA).
3. Personal Statement
4. Work Product (WP)
5. Professional Discussion (PD)
6. Assignment

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO1: ***Demonstrate knowledge of refrigeration oil charging***	1.1	Explain the safety precautions involve in charging lubrication oil in the refrigeration system,									
	1.2	Apply the techniques in charging oil lubricant in refrigeration.									
	1.3	Identify the instruments used for charging lubrication oil in refrigeration.									
	1.4	Charging of compressor lubrication oil.									
LO2: ***Understand the types of refrigeration compressor oil***	2.1	Explain the types of lubrication oil in refrigeration system.									
	2.2	Explain the splash method of lubrication oil in refrigeration,									
	2.3	Explain the force feed method of lubrication oil in refrigeration.									
	2.4	Identify factors to be considered when selecting lubrication oil.									
LO3: ***Understand the knowledge of general properties of refrigeration lubrication oil***	3.1	Explain the general concept of refrigeration lubrication oil.									
	3.2	Identify the physical properties of lubrication oil.									
	3.3	Explain the chemical properties of lubrication oil.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 12: Electrical/Electronic Control Devices used in Refrigeration and Air- Conditioning

Unit Reference Number: CON/RAC/007/3
NSQ Level: 3
Credit Value: 4
Guided Learning Hours: 40

Unit Purpose:

This unit is aimed to impact the leaner, the necessary knowledge and skills required for Electrical/Electronic Control Devices used in Refrigeration and Air conditioning Works.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development are carried out. **Simulation is not allowed** in this unit and level.

Assessment methods to be used include:

1. Direct observation (DO)
2. Written/Oral Question and Answer (QA).
3. Personal Statement
4. Work Product (WP)
5. Professional Discussion (PD)
6. Assignment

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO1: Handling electrical/ electronics control devices, in R & AC work	1.1	State the functions of the Electrical/Electronic control devices.									
	1.2	Differentiate between electrical devices and electronic control.									
	1.3	Follow the safety precautions and manufacturer guide to repair or replace faulty components.									
	1.4	Explain the steps to be followed in the installation and maintenance of electrical control devices in R & AC systems.									
LO2: Servicing of refrigeration and air- conditioning systems	2.1	Ensure cleanliness of the entire electrical components of the refrigeration equipment.									
	2.2	Check the debris buildup on the entire electrical components.									
	2.3	Check the following electrical components: contactors, thermostat, coils, motor etc.									
	2.4	Ensure that the fan control is operating correctly.									
LO3: Identify electronic devices/components used in air conditioning equipment	3.1	Explain electronics control devices in refrigeration and air conditioning.									
	3.2	Identify microcontrollers in air conditioning equipment.									
	3.3	Describe the following devices: temperature sensors and pressure sensors.									
	3.4	Identify the function of humidity sensors in refrigeration and air conditioning.									
O4: Repairing of electrical components in refrigeration and air conditioning	4.1	Carry out the installation of the thermostat.									
	4.2	Carry out replacement of voltage transformers.									
	4.3	Explain the function of the following devices: timer and counters.									
	4.4	Carry out the replacement of the current transformers.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 13: Circuit diagram as applied in refrigeration and air conditioning

Unit Reference Number: CON/RAC/008/3
NSQ Level: 3
Credit Value: 5
Guided Learning Hours: 50

Unit Purpose:

This unit is aimed to impact the leaner, the necessary knowledge and skills required to read circuit diagrams as in refrigeration and air conditioning systems.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out. **Simulation is not allowed** in this unit and level.

Assessment methods to be used include:

1. Direct observation (DO)
2. Written/Oral Question and Answer (QA).
3. Personal Statement
4. Work Product (WP)
5. Professional Discussion (PD)
6. Assignment

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO1: Demonstrate knowledge of common circuit diagrams in refrigeration and air-conditioning system	1.1	Explain the importance of circuit diagrams in refrigeration and air conditioning systems.									
	1.2	Understand symbols and conventions used in the circuit diagram.									
	1.3	Outline types of circuit diagrams in refrigeration and air conditioning systems.									
	1.4	Interpret the circuit diagrams of the refrigeration systems.									
LO2: Demonstrate the knowledge of each component in the circuit diagram of refrigeration	2.1	Explain the circuit diagram of a compressor.									
	2.2	Explain the entire electrical circuit of a refrigerator.									
	2.3	Describe the entire electrical circuit of an air conditioning unit.									
	2.4	Describe the exploded circuit diagram of a thermostat.									
	2.5	State the reason why a circuit diagram is important in refrigeration and air-conditioning.									
LO3: Apply circuit reading and observation	3.1	Read the complete circuit of an air conditioning.									
	3.2	Read the complete exploded diagram of the refrigerator to trainees.									
	3.3	Interpret wiring and piping schematics for the refrigeration units.									
LO4: Read circuit diagram	4.1	Identify signs a labeling on the circuit diagrams.									
	4.2	Explain the circuit diagram and description.									
	4.3	Describe procedures for understanding compressor capacity.									
	4.4	Use circuit diagram to diagnose system malfunction.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Unit 14: Construction of Cold Room

Unit Reference Number: CON/RAC/010/3
NSQ Level: 3
Credit Value: 6
Guided Learning Hours: 60

Unit Purpose:

This unit is aimed to impact into the learners, the necessary knowledge and skills required for the construction of a cold room.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in a real workplace environment where learning and human development are carried out. **Simulation is not allowed** in this unit and level.

Assessment methods to be used include:

1. Direct observation (DO)
2. Written/Oral Question and Answer (QA).
3. Personal Statement
4. Work Product (WP)
5. Professional Discussion (PD)
6. Assignment

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO1: ***Know cold room and cold storage***	1.1	Explain the functions and importance of cold rooms in the refrigeration industry.									
	1.2	State the key features of a cold room.									
	1.3	Explain the major components of cold room.									
LO2: ***Describe the procedures to follow for the construction of the cold room and cold storage***	2.1	Explain the difference between a cold room and cold storage.									
	2.2	Identify various components of the cold room and their functions.									
	2.3	Explain how the construction of the cold room differs from the ordinary refrigeration systems.									
	2.4	State the step-by-step procedure for the construction of the cold room.									
LO3: ***Carryout construction of a cold-room***	3.1	Demonstrate the method of building a cold room.									
	3.2	Demonstrate the Installation of the evaporating units.									
	3.3	Demonstrate the Installation of the condensing unit.									
	3.4	Demonstrate the Installation of the compressing unit.									
	3.5	Construct a cold room.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

TOOLS AND EQUIPMENT USED IN HOME APPLIANCES INSTALLATION MAINTENANCE AND REPAIRS

(Refrigeration and Air-Conditioning Repairs and Maintenance)

S/N	NAMES	REQUIRED QUANTITY
1.	Refrigerant recovery machine	
2.	Manifold Gauge Set	
3.	Vacuum Pump	
4.	Leak Detector	
5.	Digital Multimeter	
6.	Pipe Bender and Flaring Tool Kit	
7.	Tube Cutter	
8.	Swaging Tool	
9.	Nitrogen Regulator and Cylinder	
10.	Refrigeration Recovery Cylinder	
11.	Brazing Torch Kit	
12.	Soldering Iron and Flux	
13.	Pipe Insulation Cotter	
14.	Refrigeration and Air-Conditioning Simulator	
15.	Cutaway Models of HVAC Components	
16.	Computer Based HVAC Simulation Software	
17.	Training Workbenches with Tool Sets	
18.	Classroom Audiovisual Equipment	
19.	Training Manuals and NOS Materials	
20.	Safety Equipment	
21.	Personnel Protective Equipment (PPE)	
22.	Demonstration Unit of Various HVAC System	
23.	Refrigerant Identifier	
24.	Thermal Imaging Camera	
25.	Data Logging Equipment	
26.	Electrical Load Tester	
27.	Pressure Testing Equipment	
28.	Refrigerant Charging Scale	
29.	Hydraulic Pipe Bender	
30.	Computer Based Training Manuals	

(Electrical/Electronic Maintenance Equipment/Tools)

S/N	NAMES	REQUIRED QUANTITY
31.	Complete Electrical Tools Box	
32.	Digital Multimeter	
33.	Oscilloscopes	
34.	Function Generators	
35.	Soldering Stations/Work Stations	
36.	De-soldering Tools (Suckers etc)	
37.	Bread Boards	
38.	Power Supplies	
39.	Electronic Components (semiconductors)	
40.	Printed Circuit Board (PCB) Fabrication Tools	
41.	Components Tester	
42.	Logic Analyzers	
43.	Programmable Logic Controllers (PLCs)	
44.	Electronic Workbenches	
45.	Electronic CAD Soft Ware	
46.	Networking Equipment	
47.	Safety Equipment	

National Skills Qualifications

FOR

ELECTRICAL HOME APPLIANCES

LEVEL 1, 2 & 3

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