



Republic of the Philippines
DEPARTMENT OF EDUCATION



K to 12 Basic Education Curriculum Technology and Livelihood Education Learning Module



RAC SERVICING

(DOMRAC)

EXPLORATORY COURSE

Grade 7 and Grade 8

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What Is This Module About?

Welcome to the world of **REFRIGERATION AND AIR-CONDITIONING SERVICING (Dom RAC)**!

This Module is an exploratory course which leads you to **Refrigeration and Air-Conditioning (Dom RAC) National Certificate Level II (NC II)**¹. It covers **5** common competencies that a Grade 7 / Grade 8 Technology and Livelihood Education (TLE) student like you ought to possess, namely:

- 1) Prepare Materials and Tools;
- 2) Perform Mensuration and Calculation;
- 3) Interpret Technical Drawings and Plans;
- 4) Maintain Tools and Equipment; and
- 5) Perform Housekeeping and Safety Practices

These **5** common competencies are covered separately in 5 Lessons. As shown below, each Lesson is directed to the attainment of one or two learning outcomes:

Lesson 1 – Prepare Materials and Tools

- LO1. Identify materials and tools
- LO2. Request materials and tools

Lesson 2 – Perform Mensuration and Calculation.

- LO1. Select Measuring Instrument.
- LO2. Carry out Measurement and Calculation.

Lesson 3 – Interpret Technical Drawings and Plans

- LO1. Analyze signs, symbols and data.
- LO2. Interpret work plans.

Lesson 4 – Maintain Tools and Equipment

- LO1. Check the conditions of tools and equipment.
- LO2. Perform basic preventive maintenance.

Lesson 5 – Perform Housekeeping and Safety Practices

- LO1. Sort materials, tools and equipment.
- LO2. Clean workplace area, materials, tools and equipment.
- LO3. Systematize dispensing and retrieval of materials, tools and equipment.

¹**NATIONAL CERTIFICATE (NC)** is a certification issued to individuals who achieved all the required units of competency for a national qualification as defined under the Training Regulations. NCs are aligned to specific levels within the PTQF. (**TESDA Board Resolution No. 2004-13, Training Regulations Framework**)

NATIONAL CERTIFICATE LEVEL refers to the four (4) qualification levels defined in the Philippine TVET Qualifications Framework (PTQF) where the worker with:

- a. **NC I** performs a routine and predictable tasks; has little judgment; and, works under supervision;
- b. **NC II** performs prescribe range of functions involving known routines and procedures; has limited choice and complexity of functions, and has little accountability;



How Do You Use This Module?

This Module has 4 Lessons. Each Lesson has the following parts.

- Learning Outcomes
- Performance Standards
- Materials/Resources
- Definition of Terms
- What Do You Already Know?
- What Do You Need to Know?
- How Much Have You Learned?
- How Do You Apply What You Learned?
- How Well Did You Perform?
- How Do You Extend Your Learning?
- References

To get the most from this Module, you need to do the following:

1. Begin by reading and understanding the Learning Outcome/s and Performance Standards. These tell you what you should know and be able to do at the end of this Module.
2. Find out what you already know by taking the Pretest then check your answer against the Answer Key. If you get 99 to 100% of the items correctly, you may proceed to the next Lesson. This means that you need not go through the Lesson because you already know what it is about. If you failed to get 99 to 100% correctly, go through the Lesson again and review especially those items which you failed to get.
3. Do the required Learning Activities. They begin with one or more Information Sheets. An Information Sheet contains important notes or basic information that you need to know.
After reading the Information Sheet, test yourself on how much you learned by means of the Self-check. Refer to the Answer Key for correction. Do not hesitate to go back to the Information Sheet when you do not get all test items correctly. This will ensure your mastery of basic information.
4. Demonstrate what you learned by doing what the Activity / Operation /Job Sheet directs you to do.
5. You must be able to apply what you have learned in another activity or in real life situation.
6. Accomplish the Scoring Rubrics for you to know how well you performed.

Each Lesson also provides you with references and definition of key terms for your guide. They can be of great help. Use them fully.



If you have questions, ask your teacher for assistance.

LESSON 1

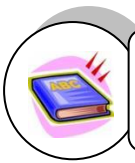
Prepare Materials and Tools



LEARNING OUTCOMES:

At the end of this Lesson, you are expected to do the following:

- LO 1. identify materials and tools; and
- LO 2. request materials and tools.



Definition of Terms

Aluminum Tubing - usually used for evaporating units in air conditioning for home & automobile

Clutch Head - used for turning with a clutch head bolt or screw

Copper Tube - use in refrigeration and air conditioning unit.

Document - written information

Flare Hose Fitting - includes assorted nylon fittings suitable to refrigerant hoses

Flaring Block - used for holding tubing according to its size so that it can be flared.

Hard Drawn Copper Tubing - used in Commercial refrigeration and air conditioning applications

Job Order - the scope of the work to be done

Pipe Cutter - the adjustable clamp-type device with sharp-edged rollers that cut the pipe as they are tightened and turned

Ratchet Handle – used to drive handle socket that fits on so that the tightening or loosening motion can be limited to a short back and forth motion.

Requisition Form - a formal written order request for equipment, tools and materials.

Service Report describes the work done in a process

Soft Copper Tubing - used in domestic and some commercial refrigeration and air conditioning work, because it is easy to bend and flare.

Soldered or Brazed Tube Fitting - used in most tubing and fitting connections that are either by soldering or silver brazing

LEARNING OUTCOME 1

Identify materials and tools

PERFORMANCE STANDARDS

- Job requirements are identified
- HVAC materials, tools are identified
- Quantity of each material to be used is determined or specified
- Correct quantity and quality of materials are determined as per job requirements



Materials

Materials

- BALLPEN
- CAPACITOR
- COPPER TUBE
- ERASER
- FILTER DRIER
- FITTING USED IN RAC
- FLUX
- JOB ORDER FORM AND REQUISITION FORM
- OVERLOAD PROTECTOR
- PAPER
- PENCIL
- REEFRIGERANT OIL
- REFRIGERANT GAS
- RELAY
- SILVER ROD
- THERMOSTAT CONTROL

TOOLS

- ADJUSTABLE WRENCH SIDE CUTTING PLIERS
- SOCKET RATCHET HANDLE
- SOCKET WRENCH
- SPARKER LIGHT
- SPIRIT LEVEL
- SWAGING TOOLS
- SYSTEM ANALYZER OR GAUGE MANIFOLD
- TUBE BENDER OR SPRING BENDER

- TUBE CUTTER
- ALLEN WRENCH
- BENCH VISE
- BLOW TORCH OR MAPP GAS
- BOX WRENCH
- CHAIN VISE
- CLAMP METER
- CLAW HAMMER
- COMBINATION PLIERS
- CONBINATION WRENCH
- FLAT SCREW
- HACK SAW
- LONG NOSE PLIERS
- MULTI-TESTER
- PHILIP SCREW
- PINCH OFF PLIERS
- PINCH OFF PLIERS
- PIPE WRENCH
- PLUMB BOB
- PORTABLE ELECTRIC DRILL
- PULL PUSH RULE
- SETS OF FLARING TOOLS



What Do You Already Know?

Let us determine how much you already know about preparing materials and tools. Take this test.

Pretest LO 1

Directions: Read the question carefully. Choose the letter of the correct answer and write your answers on a separate sheet of paper.

1. The tubing intended for refrigeration and air conditioning installation should be.
 - A. Wet
 - B. Clean and dry
 - C. Moisturized
 - D. Oily
2. The tubing to be swaged is clamped in
 - A. Flaring block
 - B. Bench vise
 - C. Vise grip
 - D. Pliers
3. Which tools are used to enlarge and swage the end of the copper tubing?
 - A. Flaring Process
 - B. Bending tools
 - C. Flaring block
 - D. Swaging tools
4. What is the excellent heat source for silver brazing?
 - A. Soldering iron
 - B. Oxy-acetylene
 - C. Blow torch
 - D. Electric stove
5. What tool is used for tightening or loosening screws in extremely closed places?
 - A. Offset
 - B. Torx head
 - C. Flat screw
 - D. Stub
6. A wrench with flat interior surface so that it is less likely to slip off when working with hex head bolts, nuts, or screws.
 - A. Open end
 - B. Box wrench
 - C. Combination
 - D. Flat nut
7. What kind of tubing is considered strong, highly resistant to corrosion, and easily connected to fittings by either flaring or brazing?
 - A. Rubber

- B. Stainless Steel Tubing
- C. Aluminium
- D. Copper

8. Which of the following tubing is installed in the suction and discharge lines of the system in order to prevent vibrations of the mechanism?

- A. Copper Tube
- B. Rubber
- C. Steel
- D. Plastic

9. Which tools are used to enlarge the end of the tubing to make flared a fitting?

- A. Swaging tools
- B. Flaring tools
- C. Bending tools
- D. Cutting tools

10. The process of applying molten metal to heated metals is called

- A. Clamping
- B. Soldering
- C. Welding
- D. Riveting



What Do You Need To Know?

Read the Information Sheet 1.1 very well then find out how much you can remember and how much you learned by doing Self-check 1.1.

Information Sheet 1.1

Use of Copper Tube in Refrigeration and Air-Conditioning Unit.

Installation of pipes and fittings in a refrigeration system is impossible without the necessary tools and materials.

Copper Tubing

The tubing that carries the refrigerant to various components is considered to be a vital part of the refrigeration system. Copper tubing is the most common materials in the refrigeration piping circuit. It is used to connect the major parts of the refrigeration system such as evaporator coil, the compressor, the condenser coil and the expansion valve, most copper tubing is available from 1/8 inch to 3/4 inch of a diameter. The end are capped or plugged to keep the inside of the tubing clean and dry. It is also available in soft and hard types.

Copper tubing is available in three types. Type K, L and M. Type K tubing is used for heavy duty purpose because of its thick wall. Type L tubing is used for Six interior plumbing and heating. It is the common types used in HVAC system. Type M is used for light duty work



1. Soft copper tubing. This is used in domestic and some commercial refrigeration and air conditioning work, because it is easy to bend and flare. Being bendable, this tubing must be supported by suitable brackets or clamp in installation, so soft copper tubing is often used with flared and soft soldering fittings. It is also sold in rolls of 1, 35, and 50 ft long.



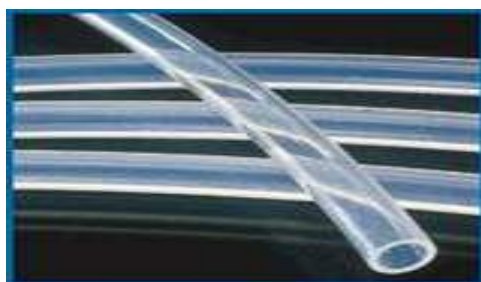
2. Hard drawn copper tubing. This is used in commercial refrigeration and air conditioning applications. Being hard and stiff, it needs few clamps to support it in installation. Hard drawn copper tubing should not be bent so use straight lengths and fitting to form the necessary tube connection. Hard- drawn refrigeration tubing joints should be silver brazed to eliminate leaks.



3. Steel tubing. This is a thin wall tubing used in refrigeration and air conditioning work, Its size is practically the same as that of copper tubing, hence connections may be made on steel tubing by using either flare joints or silver brazed joints.



4. Stainless steel tubing. This is a strong type of tubing that is very resistant to corrosion. It is also easily connected to fitting by either flaring or brazing because of this qualities, stainless steel is often required in food processing, ice, oven, manufacture, milk handling system, and similar works



5. Plastic tubing. This type of tubing with polyethylene is one of the most common substances used in the manufacture of plastic tubing. The usual safe temperature is from 100 degrees centigrade ($^{\circ}\text{C}$) to +175 degrees centigrade ($^{\circ}\text{C}$) you should never use this tubing where fluid temperature goes beyond this limit. Polyethylene tubing is not used in refrigerating mechanism but in cold water lines in water cooled condensers.



6. Flexible tubing (hose). This is commonly used tubing in suction lines in many refrigeration system and in commercial air conditioning application. This type serves to prevent vibration in the mechanism. Air conditioning equipment for a motor vehicle requires the use of flexible tubing since the vehicle is always moving.

7. Aluminum tubing. It is usually used for evaporating units in air conditioning for home and auto-mobile. Commonly, it is used for evaporator (freezer) of the domestic refrigerators. Special type of treatment for soldering or brazing is needed.

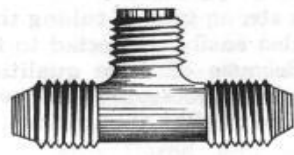
Fitting:

A fitting is a device used to connect tubes of different widths and lengths.



1. Flaring tube fitting. This is used in flared type connection to attach fittings in copper tubing. There are many different fittings which are hexagonal in shape for wrench attachment. These threaded fittings must be carefully handled to prevent damage. All fittings used are based on the tubing size.

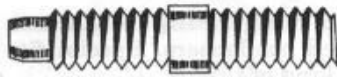
The common flare type fittings used in refrigeration and air conditioning works are the following.



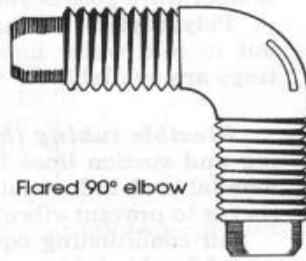
Flare tee fitting



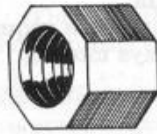
Flare union coupling



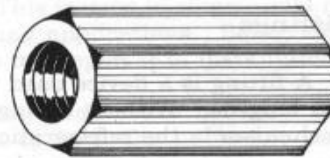
Flared half-union coupling



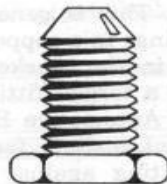
Flared 90° elbow



Flare nut

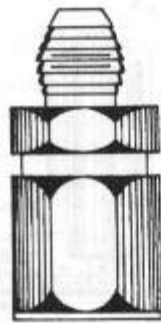


Flare cap

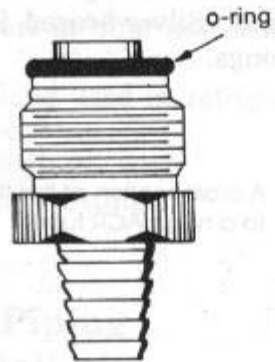


Flare plug

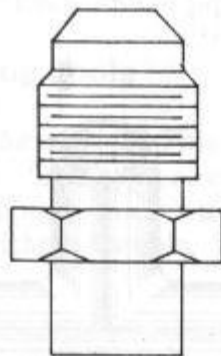
2. Flare hose fitting - This includes assorted nylon fittings suitable to refrigerant hoses. Such as the following :



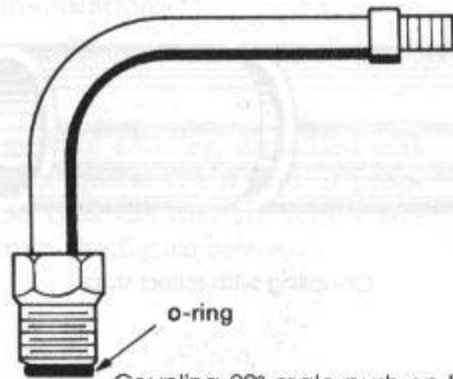
Coupling straight male 45° flare, screw-on reusable



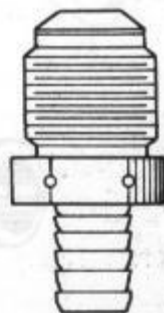
Coupling straight male push-on barb-type reusable with o-ring seal



Coupling straight male 45° flare, permanent crimped-on non-reusable



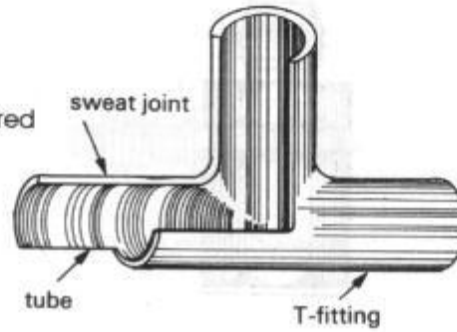
Coupling 90° male push-on barb-type reusable with o-ring seal



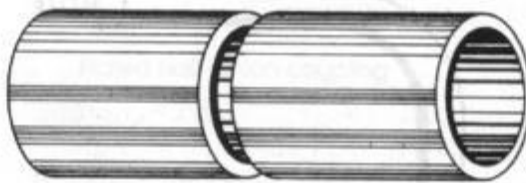
Coupling straight male 45° flare, push-on

3. Soldered or brazed tube fitting - This type is used in most tubing and fitting connections that are either by soldering or silver brazing. Soldered joints are used for water pipes and drains. Silver brazed joints are used for refrigerant pipes and fittings.

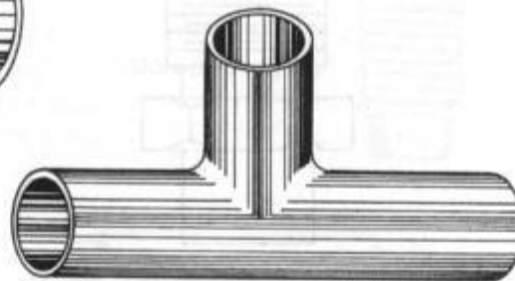
A cross section of the fitting soldered to a hard ACR tube



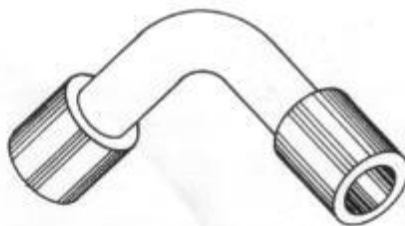
The common fittings which may either be soldered or silver brazed to tubing are as follows:



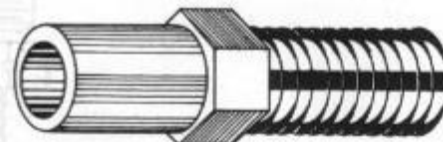
Coupling with rolled stop



Tee



90° elbow



Adaptor

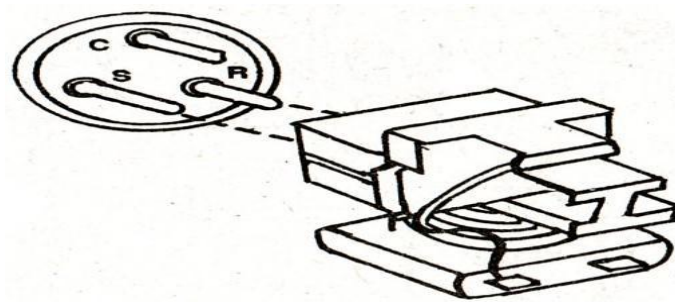
Filter Drier



Soldered Type Filter Drier



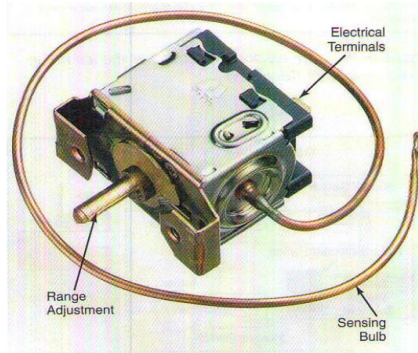
Flare Nut



Relay



Overload Protector



Thermostat Control

TOOLS:

Types of screwdrivers and their uses:

- a. Standard slot is a tool used for turning with a slot-head bolt or screw



- b. Philips is a tool used for turning with Philips-head bolts or screw



- c. Clutch head is a tool used for turning with a clutch head bolt or screw



- d. Torx head is a tool used for turning with a torx bolt or screw



e. Stub is a tool used for tightening or loosening in places where a longer blade will not fit especially in narrow places.



f. Offset is a tool used for tightening or loosening in extremely close places.



Types of Wrenches and Their Uses

a. Open wrench is a tool used for working with hex-head bolts, nuts, or screws.



b. Box wrench refers to the tool with flat interior surfaces so that it is less likely to slip off when working with hex-head bolts, nuts, or screws when added torque is applied.



c. Combination wrench is a tool with an open end and a box end. It is designed for the convenience of an operator who may need an open end for speed tightening and loosening while the box end is used for adding torque.



d. Adjustable open wrench is a tool used for working with hex-head bolts, nuts, and screws of various sizes.



e. Pipe wrench is a tool used for working with pipe, pipe fittings, and other rounded surfaces.



f. Flare nut wrench is a tool used for working with hex-head nuts, bolts, or screws in which the open end permits the wrench to slip over tubing.



Types of Pliers and Their Uses

a. Slip joint is a tool used for holding or turning a part where surface marring is not a problem.



b. Slip groove is a tool used on a wider surface and where more leverage may be required.



c. Long Nose is a tool used for holding small nuts, screws, or for reaching hard reached places.



d. Diagonal cutter is a tool used for cutting wire only.



e. Self-locking pliers is a tool used for working where tight grip is needed. It also locks in place to free operator to use another tool.



f. Pinch-off wrench is a tool designed especially to crimp refrigeration tubing to prevent loss of refrigerant when a tube is being soldered or brazed.



Types of Hammer and Their Uses

a. Ball peen hammer is a tool used for hammering metal tools such as punches and chisels.



b. Soft face hammer is a tool made of plastic, rawhide or material that will not mar or break other tools or materials being hammered.



c. Sledge hammer is a tool made with a heavy steel head and a long handle for breaking or pounding with substantial force.



d. Claw hammer is a tool used for driving or pulling nails



Punches, Chisels, Bars and Their Uses

a. Pin punch is a tool used for driving both straight and tapered pins into or out of hubs or shafts.



b. Centre punch is a tool used for indenting metal to safely start a drill.



c. Flat chisel is a tool used for cutting off bolt heads or splitting nuts.



d. Pry bar is a tool used for a variety of jobs, but generally for prying equipment into alignment.



e. Scratch awl is a tool used for making on metal, making screw holes in sheet metal, and for aligning screw holes.



Types of Files and Their Uses

a. Flat file is a tool used for smoothing metal surfaces; the surface is double-cut to help promote even application.



b. Half round file is a tool used for fitting rounded surfaces.



c. Round File is a tool used for smoothing or enlarging holes in metal; because of the tapered end, they are often called “rat-tail” files.



d. Point file is a tool used for cleaning up damaged threads or other “fine” work; it is sometimes called a “saw” file.



e. Triangular file a tool used for working in tight places and “fine” finish work.

Socket Sets and Their Uses



- a. Ratchet Handle is used to drive handle socket that fits on so that tightening or loosening motion can be limited to a short back and forth motion.



- b. Socket. Is a device that snaps onto a ratchet handle so the device can be used to work on hex-head bolts or nuts.



- c. Deep socket. Is a device that snaps on to a ratchet handle so the device can be used to work on hex-head bolts or nuts that are in recessed places that a regular socket cannot reach.



d. Extension. Refers to a rod that extends from the socket to the handle to extend the socket into hard-to-reach places.



e. Torque wrench is a tool used for tightening hex-head bolts and nuts to specified limits



f. Speed handle is a tool used to drive by operating with both hands so that an operator can loosen or tighten nuts and bolts quickly.

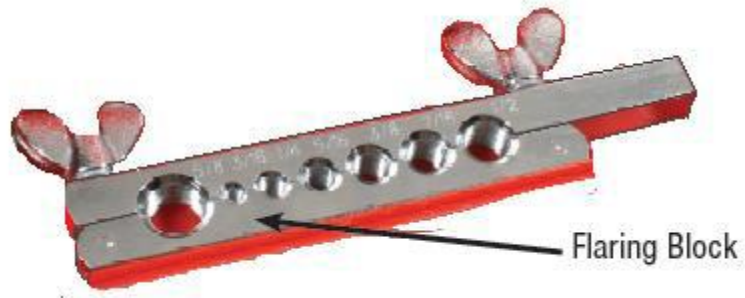


g. Universal joint refers to device that fits between a handle and a socket to permit the socket to be turned to any one of several angles and to facilitate hard-to-reach nuts and bolts.

Tubing Tools and Their Uses



a. Tubing cutter is a tool used for smoothly cutting tubing with opposing cutting wheels that are slowly tightened by a ratchet-like control as the cutter is turned around.



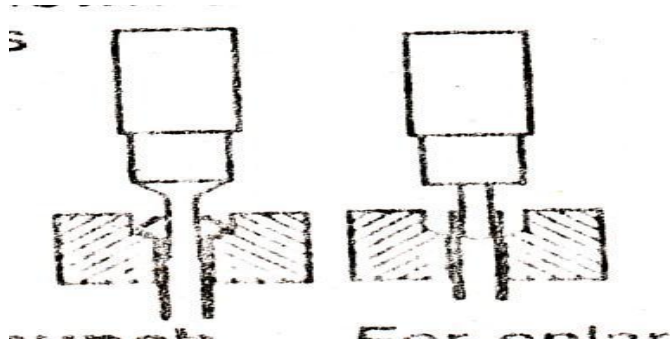
b. Flaring block is a tool used for holding tubing according to its size so that it can be flared.



- c. Flaring tool is a tool used for forcing a 45o cone into the end of a copper tube being held in a flaring block.



- d. Tube reamer is a tool used for cleaning burrs inside the tubing that has been cut; it is often built into a tubing cutter.



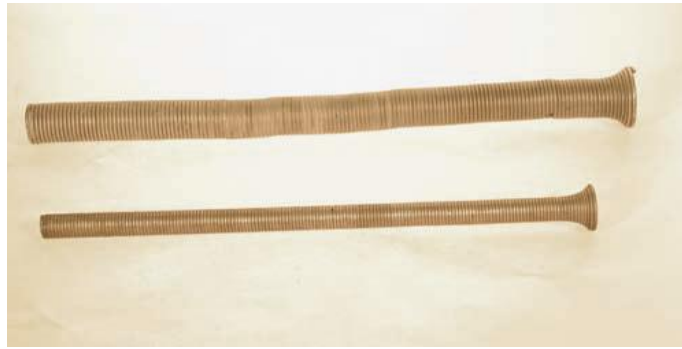
- e. Double flare punch is a tool used with a flaring block to bend tubing back and force it down and roll it into the open tubing end to make a tube with double thickness.



- f. Swage punch is a tool used for enlarging the end cut tubing so that another tube size can be placed into the tubing and soldered



- g. Lever-type bender is a tool used for bending tube in such a way that the tubing will retain its rounded shape and not flatten out at the point of the bend.



h. Bending spring is a tool used for placement over the outside of the tubing to keep the tubing from collapsing while it is being bent.

Threading Tools and Their Uses



a. Tap is a tool used for cutting inside threads in a hole.



b. Hand tap wrench refers to the handle used for threading inside threads with a tap.



c. T-handle tap Wrench refers to the handle with an adjustable holding device much like the chuck on a drill. Used with a tap to drill inside threads, especially smaller size threads.



- d. Round stock die is a tool used for cutting external threads on round stock and is available in many sizes and specifications



- e. Die stock refers to the handle that fits over a round a die to secure it and facilitate turning.



- f. Pipe cutter refers to the adjustable clamp-type device with sharp-edged rollers that cut into pipe as they are tightened and turned



- g. Pipe die is a tool used for cutting external threads on pipe.



- h. Pipe die stock ratchet is a tool used for handle designed especially for speeding up the cutting of external pipe threads.

Other Hand Tools and Their Uses



- a. Wire stripper is a tool used for removing insulation from electrical wires without damaging the wires.



- b. Drop light is a tool used to provide light in dark or poorly-lit work areas. These lights frequently have an electrical outlet in the handle, but because they are made of small-gauge wire, they should not be used to power appliances such as refrigerators.



- c. Oil can refers to a tool that has a long, flexible spout to reach hard-to-reach places, a cap to prevent oil from dripping out.



- d. Hack saw is a tool used for cutting metals in installation and service work, but not recommended for cutting refrigeration tubing because the fittings can contaminate a system.



- e. Screw starter is used for starting small slot or Philips head screws in hard-to-reach places.



How Much Have You Learned?

Self-Check 1.1

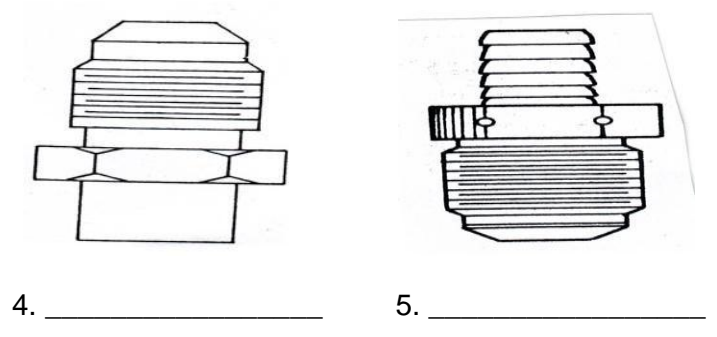
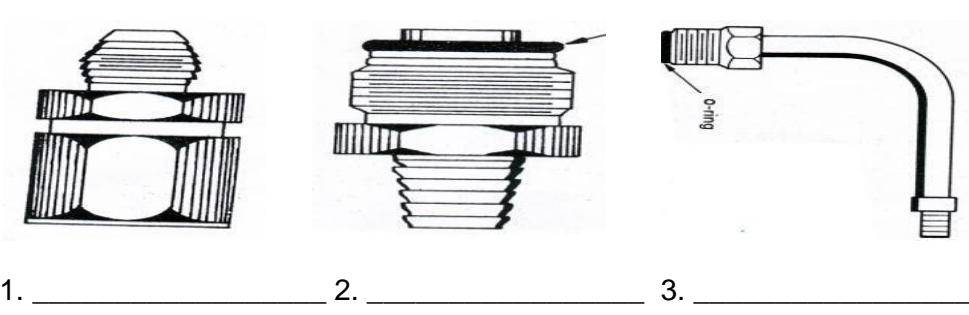
I. Multiple Choice. Read the questions carefully. Choose the letter of the correct answer and write your answers on a separate sheet of paper.

- The most common tubing used in refrigeration and air-conditioning is made of
 - copper
 - plastic
 - wood
 - zinc
- The hand tools used to tighten and loosen the flare nut fitting is
 - flaring tool
 - pliers
 - self-locking pliers
 - Adjustable wrench
- The tubing to be swaged is clamped in
 - bench
 - flaring block
 - Pliers
 - self-locking pliers
- Which tools are used to enlarge the end of the tubing to make a flared fitting?
 - bending tools
 - cutting tools
 - flaring tools
 - swaging tools
- What kind of tubing is considered strong, highly resistant to corrosion, and easily connected to the fitting by either flaring or brazing?
 - flexible hose
 - aluminum
 - copper
 - stainless steel
- The tubing intended for refrigeration and air conditioning installation should be
 - clean and dry
 - moisturized
 - oily
 - wet
- What is the excellent heat source for silver brazing?
 - blow torch
 - electric stove
 - oxy-acetylene
 - soldering iron
- Which of the following tubing is installed in the suction and discharge line of the system in order to prevent vibration of the mechanism?
 - copper tube
 - flexible
 - plastic
 - steel
- The process of applying molten metal to heated metals is called
 - clamping
 - riveting
 - soldering
 - welding
- Which tools are used to enlarge the end of the copper tubing so that the two pieces at the same diameter are joined without fitting?
 - bending tools
 - Flaring tools
 - flaring block
 - swaging tool

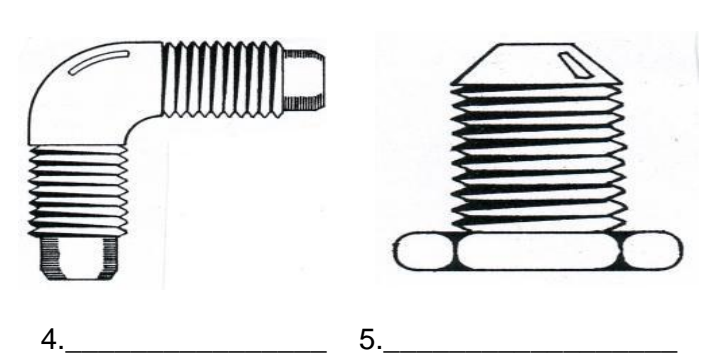
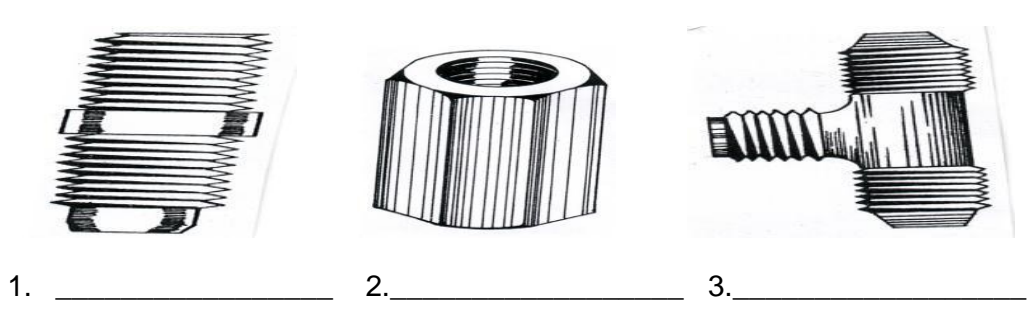
II. Identification Type

Directions: Identify the following materials and tools then write the correct answer on a separate sheet of paper.

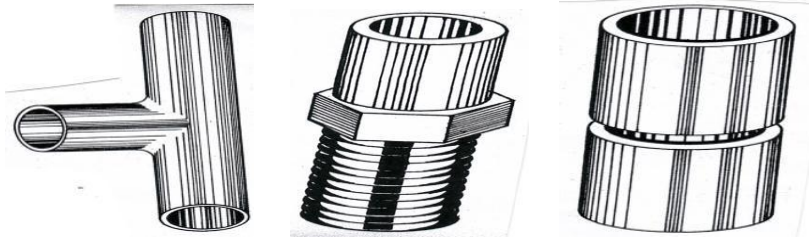
A. Flexible Hose Fitting



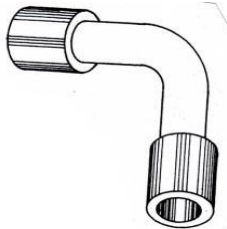
B. Flared Tube Fittings



C. Soldered or Blazed Fitting



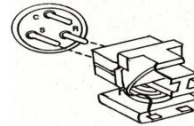
1. _____ 2. _____ 3. _____



4. _____

III. Identification Type

Directions: Identify the following materials in refrigeration. Write your answers on a separate sheet of paper



1. _____ 2. _____ 3. _____



4. _____ 5. _____

IV. Matching Type

Directions: Match the pictures in Column A with name of tools in Column B .Write ONLY the letter of your answer on another sheet of paper

Column A

Column B



1. _____

a. Claw hammer



2. _____

b. Adjustable wrench



3. _____

c. Tube cutter



4. _____

d. Flare yoke



5. _____

e. Pipe vise



6. _____

f. Mechanical bender



7. _____

g. Philip screw driver



8. _____

h. Long nose pliers



9. _____

i. Vise grip



10. _____

j. Pinch off pliers

Refer to the Answer Key. What is your score?



How Do You Apply What You Have Learned?

Show that you learned something by doing this activity

Activity Sheet 1.1

- I. Read the instructions carefully; prepare an extra sheet of paper and follow instructions carefully.

Draw Five (5) of each Tools that are available in the tool room.

- a. Boring tools
- b. Cutting tools
- c. Measuring tools
- d. Testing tools
- e. Holding tools

II. Read the instructions carefully .Student will visit the panel and tool room. Write your answer on another sheet of paper following the format below.

1. List down the available materials and tools in the tool panel or tool room.
2. Group them according to each classification of tools.

Name:		Date:		
Year and Section:		Teachers Name:		
Classification	Number of Pieces	Good	Repair	Replace
Boring Tools				
Cutting Tools:				

Holding Tools:				
Measuring Tools:				
Testing Tools				
Materials				
Equipment				

LEARNING OUTCOME 2

Request materials and tools

PERFORMANCE STANDARDS

- Refrigeration materials needed are requested according to list prepared
- Requisition form/slip is accomplished accurately and properly
- Request is done as per company standard operating procedure



Materials

- **REQUISITION SLIP**
- **PAPER BALLPEN AND PENCIL**
- **ERASER OR CORRECTION LIQUID**
- **ORGANIZATIONAL CHART**



What Do You Already Know?

Let us determine how much you already know about the requisition of materials and tools. Take this test.

Pretest LO. 2

Multiple Choice. Choose the best answer. Write the LETTER ONLY of your answer on another sheet of paper.

1. indicates the task in which the materials will be used.

Example: Repair of an aircondition unit

- A. Balance on Hand
- B. Job Order
- C. Unit Price
- D Name of Project.

2. indicates the quantity and unit of materials still available in the stockroom

- A. Balance On Hand
- B. Job Order
- C. Barrower
- D. Name of Project

3. is a number and units of materials requested

- A. Balance on Hand
- B. Name of Project
- C. Unit Price
- D. Requisition Quantity and Unit

4. write the unit of measuring quantity

- A. Unit
- B. Job Order
- C. Name of Project
- D. Balance on Hand

5. write the name of material and description or

Specification (e.g. Copper Tube $\frac{1}{4}\emptyset$)

- A. Job Order
- B. Material/ Description
- C. Unit Price
- D. Barrower

6. is a price of material per piece or per unit

- A. Unit Price
- B. Barrower
- C. Name of Project
- D. Job Order

7. is a unit price X Quantity (ex. 3 pc x P30 = P90.00)

- A. Balance on Hand
- B. Barrower
- C. Total Price
- D. Job Order

8. is a name and signature of the person requesting tools and materials.

- A. Balance on Hand
- B. Name of Project
- C. Job Order
- D. Barrower

9. is the one who is responsible to take care the of the tool room

- A. Tool Keeper
- B. Barrower
- C. Unit Price
- D. Job Order

10. is workings sheet that server as a complete guide of the student to a certain task to be done.

- A. Requisition Quantity and Unit
- B. Job Order
- C. Barrower
- D. Requisition Quantity and Unit



What Do You Need To Know?

Read the Information Sheet 2.1 very well then find out how much you can remember and how much you learned by doing Self-check 2.1

Information Sheet. 2.1

Sample of REQUISITION FORM

NAME: _____ DATE: _____

AREA/SECTION: _____

QUANTITY	UNIT	DESCRIPTION	Unit Price	Total Price
1.	3	Ft.	Copper Tubing ¼ diameter	
2.	2	Ft.	Capillary Tube	
3.	1	Pc.	Filter Drier	
4.	2	Pcs.	Access Valve	
5.	1	Pint	Flux	
6.	1	Pc.	Flo	
7.	4	Pcs.	Flaring Nut	
8.	2	Pcs.	Relay	
9.	1	Pc.	Thermostat	
10.	2	Pcs.	Union Fitting	

Prepared By:

Student's Name and Section

Inspection By:

Tool Keeper

Checked By:

Teacher's Name

Preparing Service report

The documentation process in a company may vary from one form to another. The most common is the Service Report or sometimes called Job Order Form.

The Service Report describes the work done in a process and the resources used. These forms help in assessing the cost (charge) of the service rendered. It will also serve as the record for the servicing company, which can be used as reference for future servicing job with the same client service record and can also be used as cross reference in requesting materials, tools and equipment.

Every Service Report has an issue number or control number assigned to it. This is to identify the work done. This control number will be the reference to all documentation done related to the job like requisition of supplies, tools, materials and equipment.

PARTS OF A SERVICE REPORT

Customer's Data

In this part you are to fill-up the name of the customer, the contact number, the address and the date you finished the service.

SERVICE REPORT		
Customer:	Tel. No.:	Date:
Address		

Job Done

In this part of the service record, you tick on the type of service you render

JOB DONE			
<input type="checkbox"/> Pulldown evaporator	<input type="checkbox"/> Cleaning	<input type="checkbox"/> Welding	<input type="checkbox"/> Replacement
<input type="checkbox"/> Replace	<input type="checkbox"/> Expansion valve	<input type="checkbox"/> Receiver Drier	
<input type="checkbox"/> Pulldown compressor	<input type="checkbox"/> overhaul	<input type="checkbox"/> Smi-overhaul	<input type="checkbox"/> Cange oil
<input type="checkbox"/> Replace comp.	<input type="checkbox"/> Leak repair	<input type="checkbox"/> Replace magnetic coil	
<input type="checkbox"/> Replace comp. incl. bracket fabrication			
<input type="checkbox"/> Electrical repair/Change wiring	<input type="checkbox"/> Single/Dual	<input type="checkbox"/> Major/Minor	<input type="checkbox"/> Replace clutch bearing

<input type="checkbox"/> Pulldown Condenser/ radiator	<input type="checkbox"/> Replace/ Repair	<input type="checkbox"/> Cleaning	<input type="checkbox"/> Retighten rotor
<input type="checkbox"/> Auxiliary fan	<input type="checkbox"/> Replace/ Repair	<input type="checkbox"/> Install	
<input type="checkbox"/> Replace/Modify	<input type="checkbox"/> D-Hose	<input type="checkbox"/> S-Hose	<input type="checkbox"/> H-Hose
<input type="checkbox"/> Pulldown pipes	<input type="checkbox"/> Repair w/ brazing	<input type="checkbox"/> Modify	<input type="checkbox"/> Replace
<input type="checkbox"/> Flushing of A/C system	<input type="checkbox"/> Single	<input type="checkbox"/> Dual	
<input type="checkbox"/> Replace	<input type="checkbox"/> Idler bearing	<input type="checkbox"/> Pulley	<input type="checkbox"/> Belt
<input type="checkbox"/> Others, Please specific			

Parts and Consumables

This part of the service record is where you tick on the parts and consumables you requested in the company which is used in the job. The cost of the said parts or consumables will be added to the service fee as the total cost of service.

PARTS CONSUMABLES		
ITEM	QUANTITY	DESCRIPTION
<input type="checkbox"/>		Compressor
<input type="checkbox"/>		Evaporator
<input type="checkbox"/>		Expansion Valve
<input type="checkbox"/>		Condenser
<input type="checkbox"/>		Switch
<input type="checkbox"/>		Bulb
<input type="checkbox"/>		Capillary Oil <input type="checkbox"/> Pag/Synthetic <input type="checkbox"/> Mineral
<input type="checkbox"/>		Refrigerant <input type="checkbox"/> 134 A <input type="checkbox"/> B12 <input type="checkbox"/> Others
<input type="checkbox"/>		Thermostat

<input type="checkbox"/>		Relay
<input type="checkbox"/>		Overload Protector
<input type="checkbox"/>		Gasket
<input type="checkbox"/>		Hose
<input type="checkbox"/>		Nitrogen
<input type="checkbox"/>		Bolt
<input type="checkbox"/>		Wires
<input type="checkbox"/>		Filter Drier

Readings

This part of the service record indicates the reading of the low side and high side refrigeration system after repairing the unit.

READINGS

SUCTION PRESSURE: _____

DISCHARGE PRESSURE: _____

Authentication

This part of the service record indicates the authenticity of the document.

You as servicing need to sign this part as proof that you rendered the service stated at the Job Done Section, indicating also your certification number to prove that you are qualified. In the other hand, the owner or customer needs also to sign his name as a proof that he receives the service you rendered. A control number is added to this part which serves as reference to every document you have done.

TECHNICIAN _____ <div style="text-align: center;">Name and Signature</div>	CERTIFICATION NO. _____
OWNER: _____ <div style="text-align: center;">Name and Signature</div>	<div style="border: 1px solid black; display: inline-block; padding: 2px;">No. 00000</div>

Example of JOB REPORT FORMS

SERVICE REPORT			
Customer:	Tel. No.:	Date:	
Address:			
JOB DONE			
<input type="checkbox"/> Pulldown Evaporator	<input type="checkbox"/> Cleaning	<input type="checkbox"/> Welding	<input type="checkbox"/> Replace
<input type="checkbox"/> Replace	<input type="checkbox"/> Expansion valve	<input type="checkbox"/> Receiver drier	
<input type="checkbox"/> Pulldown compressor	<input type="checkbox"/> Overhaul	<input type="checkbox"/> Semi-overhaul	<input type="checkbox"/> Change oil
<input type="checkbox"/> Replace comp.	<input type="checkbox"/> Leak repair	<input type="checkbox"/> Replace magnetic coil	
<input type="checkbox"/> Replace comp. incl. bracket fabrication			
<input type="checkbox"/> Electrical repair/Change wiring	<input type="checkbox"/> Single/Dual	<input type="checkbox"/> Major/Minor	<input type="checkbox"/> Replace clutch bearing
<input type="checkbox"/> Pulldown condenser/radiator	<input type="checkbox"/> Replace/Repair	<input type="checkbox"/> Cleaning	<input type="checkbox"/> Retighten rotor
<input type="checkbox"/> Auxiliary fan	<input type="checkbox"/> Replace/ Repair	<input type="checkbox"/> Install	
<input type="checkbox"/> Replace/Modify	<input type="checkbox"/> D-Hose	<input type="checkbox"/> S-Hose	<input type="checkbox"/> H-Hose
<input type="checkbox"/> Pulldown pipes	<input type="checkbox"/> Repair w/brazing	<input type="checkbox"/> Modify	<input type="checkbox"/> Replace
<input type="checkbox"/> Flushing of A/C system	<input type="checkbox"/> Single		<input type="checkbox"/> Dual
<input type="checkbox"/> Replace	<input type="checkbox"/> Idler bearing	<input type="checkbox"/> Pulley	<input type="checkbox"/> Belt
<input type="checkbox"/> Others, Please specify			
PARTS CONSUMABLES			
ITEM	QUANTITY	DESCRIPTION	
<input type="checkbox"/>			

□
□
□
□
□
READINGS SUCTION PRESSURE: _____ DISCHARGE PRESSURE: _____
TECHNICIAN _____ CERTIFICATION NO. _____ <div style="text-align: center;">Name and Signature</div>
OWNER: _____ No. 00000 <div style="text-align: center;">Name and Signature</div>



How Much Have You Learned?

Self-Check 2.1

Multiple Choice. Choose the best answer. Write the LETTER ONLY of your answer on another sheet of paper.

1. It refers to a person who administered in the school.
A. Vocational School Administrator C. Teacher
B. Barangay Captain D. Student
2. It refers to the person with a non-teaching position and his duty is to receive the request of materials and tools of the entire teacher.
A. Store Officer C. Safety Officer
B. Supply Officer D. Head Teacher
3. It refers to a person who administered the teacher within their Department of Area of Specialization.
A. Safety Officer C. Head Teacher
B. Teacher D. Supply Officer
4. It refers to the person who assigns to teach his/her students and manage the shop activity.
A. Leadman C. Supply Officer
B. Leadwoman D. Teacher
5. It refers to the student assigned to supervise what is inside the tool room. He will also check the record all the time.
A. Store keeper C. Worker
B. Tool Keeper D. Leadman
6. It refers to the student who is assign to supervise all the materials inside the shop
A. Material Officer C. Leadwoman
B. Supply Officer D. Worker

7. It refers to the student to supervise through the help of his/her teacher to minimize the minor and major accidents in the school .

- A. Tool Keeper
- B. Material Officer
- C. Safety Officer
- D. Worker

8. It refers to the student who assign to supervise in the absent of his/her teacher in storing the materials and tools inside the room or shop.

- A. Store Keeper
- B. Leadman
- C. Safety Officer
- D. Teacher

9. It refers to the student will guide all male students in performing the activity in the school.

- A. Leadman
- B. Tool Keeper
- C. Suppy Officer
- D. Leadwoman

10. It refers to the student will guide all woman students in performing the activity in the school.

- A. Supply Officer
- B. Material Officer
- C. Worker
- D. Leadwoman

Refer to the Answer Key. What is your score?



How Do You Apply What You Have Learned?

Show that you learned something by doing this activity.

Activity Sheet 2.1

Directions: .The students will fill up the form/slip and answer the situationn given below

Situation: The air condition unit in the computer room is very dirty; the teacher will guide his student on how to request the tools and materials and fill up form/slip and submit to the tool keeper

Requisition Slip

NAME: _____ DATE: _____
 AREA/SECTION: _____ Shop Teacher: _____

Purpose: _____

Time	Quantity	DESCRIPTION	Remarks	Signature of Client

Prepared By:

Student's Name and Section

- 10 to 8 Excellent
- 7 to 5 Very Satisfactory
- 4 to 2 Good
- 1 to 0 Needs Improvement

Inspection By:

Tool Keeper

Checked By:

Teacher's Name

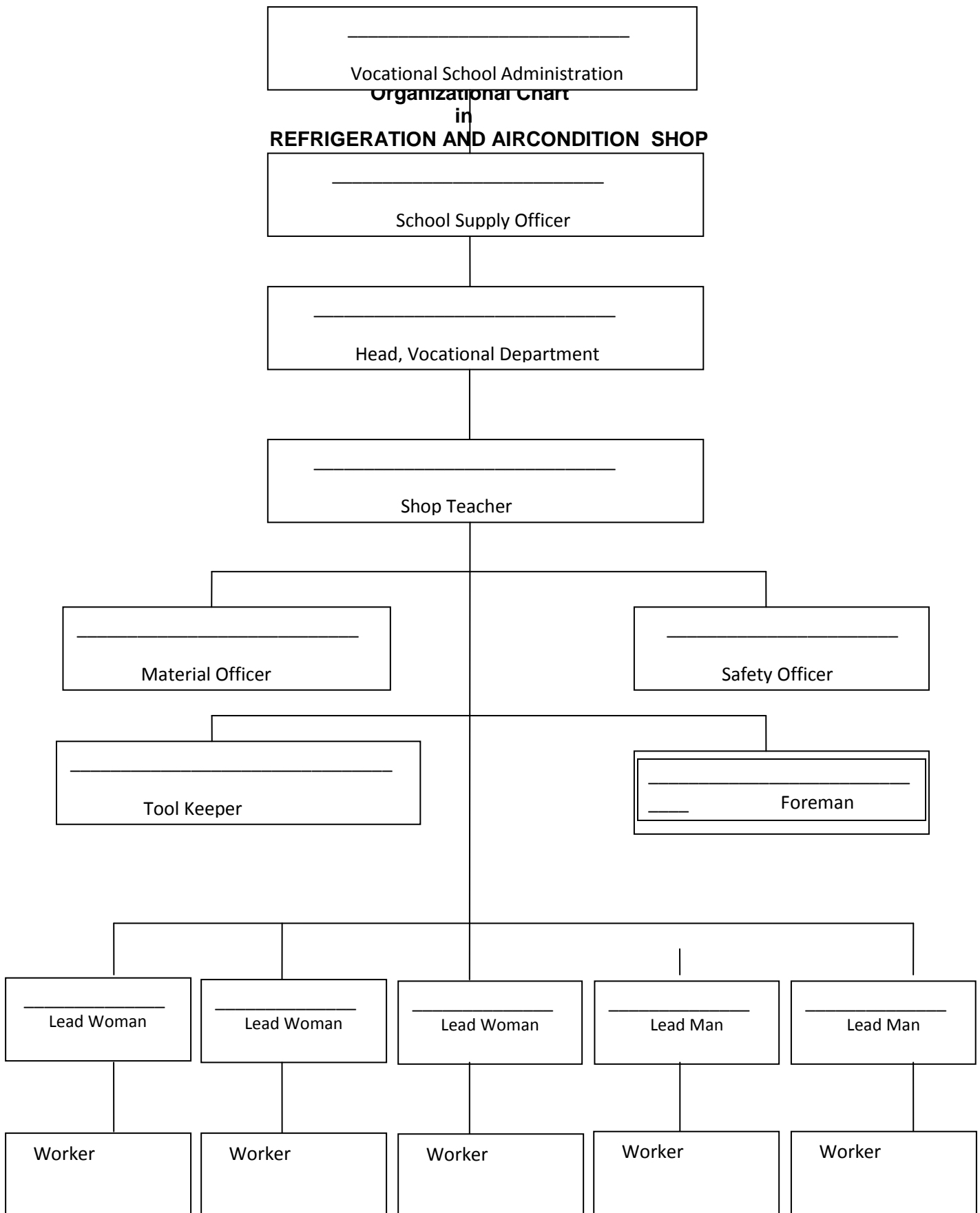


How Do You Apply What You Have Learned?

Show that you learned something by doing this activity

Activity Sheet 2.2

I. Make an Organizational chart of the different members inside the room indicating the duties and responsibilities





How Do You Apply What You Have Learned?

Show that you learned something by doing this activity

Operation Sheet 2.1

I. Making a Job Report

Instructions:

1. Make a service report
2. Fill up the service record based on the situation below. Your identification number is your I.D. Number.
3. Let your teacher sign as your customer for the said job. Then let him check your work

Situation:

You have installed a used window type air conditioning unit in a classroom.

The unit was installed at the window sill at the back part of the room.

In the process of installing the unit, you have used hoses, sealant (foam), metal screws (8pcs.) and steel brackets. The sealant was provided by the owner.

The rest of the materials were provided by the school.

I. Filling up Requisition Form

Requisition Slip

NAME: _____ DATE: _____

AREA/SECTION: _____ Shop Teacher: _____

Purpose: _____

Time	Quantity	DESCRIPTION	Remarks	Signature of Client

Prepared By:

Student's Name and Section

Inspection By:

Tool Keeper

Checked By:

Teacher's Name



How Well Did You Perform?

**Find out by accomplishing the Scoring Rubric honestly and sincerely.
Remember it is your learning at stake!**

Excellence	10 to 8 - Can perform this skill without supervision and with initiative and adaptability to problem situations.
Very Satisfactory	7 to 5 - Can perform this skill satisfactorily without assistance or supervision.
Good	4 to 3 - Can perform this skill satisfactorily but requires some assistance and/or supervision.
Needs Improvement	2 to 1 - Can perform parts of this skill satisfactorily, but requires considerable assistance and/or supervision.

REMARKS:

CHECKED BY:

TEACHER IN CHARGE

Performance Test

Learner's Name	Date

Competency:	Test Attempt		
	1st	2nd	3rd

<p>Directions:</p> <p>CALL INSTRUCTOR, ask instructor to assess your performance in the following critical task and performance criteria below</p> <p>You will be rated based on the overall evaluation on the right side.</p>	OVERALL EVALUATION	
	Level Achieved	PERFORMANCE LEVELS
		4 - Can perform this skill without supervision and with initiative and adaptability to problem situations.
		3 - Can perform this skill satisfactorily without assistance or supervision.
		2 - Can perform this skill satisfactorily but requires some assistance and/or supervision.
		1 - Can perform parts of this skill satisfactorily, but requires considerable assistance and/or supervision.
	Instructor will initial the level achieved.	

PERFORMANCE STANDARDS	Yes	No	N/A
For acceptable achievement, all items should receive a "Yes" or "N/A" response.			



Congratulations! You did a great job! Rest and relax a while then move on to the next lesson. Good luck!

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LESSON 2

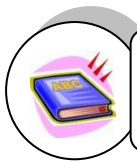
Perform mensuration and calculation



LEARNING OUTCOMES:

At the end of this Lesson you are expected to

- LO 1. select measuring instruments; and
- LO 2. carry out measurement and calculation.



Definition of Terms

Accuracy – correctness, exactness, inaccuracy, nice, precision, rightness,

Calibrate – to position indicators in determining accurate measurement

Infinite is the unlimited extending beyond measure or comprehension

Instrument – a device that measures or controls something

Kelvin scale – a thermometric scale that measures absolute Zero (A°) which is equal to - 273.16 degrees Centigrade ($^\circ C$)

Measurement – the size, length, quantity or rate of something that has been measured.

Megger is an instrument used to measure the insulation resistance of conductors or wire. It gives measurement in ohms or meg-ohms.

Mensuration – the calculation of geometric quantities or rate of something that has been measured

PPE – Personal Protective Equipment

Pressure – the force acting on a surface divided by area over which it acts

PSI an abbreviation for pounds per square inch

Rankine Scale another form of temperature scale used.

Volume – magnitude size intent , dimension, areas, bulk, mass the total amount of something

Weight – the total quantity of heaviness and things determined by their mass or control acts efforts to lift or move them

Wire Gauge is used to measure magnetic wire.

LEARNING OUTCOME 1

Select measuring instruments

PERFORMANCE STANDARDS

- Object or component to be measured is identified, classified, and interpreted according to the appropriate regular geometric shape;
- Measuring tools are selected/identified as per object to be measured or job requirements.
- Work pieces are measured according to job requirements.



Materials

- **MULTI-TESTER**
- **CLAMP METER**
- **SYSTEM ANALYZER**
- **THERMOMETER**
- **PULL PUSH RULE**



What Do You Already Know?

**Let us determine how much you already know selecting measuring instruments.
Take this test.**

Pretest LO 1

Direction: Read the questions carefully. Choose the letter of the best answer and write it on a separate sheet of paper.

1. It is an electrical instrument used to measure the flow of the electric.
 - A. voltmeter
 - B. ohmmeter
 - C. ammeter
 - D. wattmeter
2. It is an electrical instrument used to measure electrical resistance.
 - A. voltmeter
 - B. ohmmeter
 - C. ammeter
 - D. wattmeter
3. It is an instrument used to measure fractions of units.
 - A. voltmeter
 - B. try square
 - C. caliper
 - D. ohmmeter
4. It is an electrical instrument used to measure potential difference.
 - A. voltmeter
 - B. wattmeter
 - C. ammeter
 - D. micrometer
5. It is an device to measure temperature.
 - A. Anemometer
 - B. Thermometer
 - C. manometer
 - D. mega-ohmmeter

6. It refers to the part of multi-tester appears the exact amount of voltage and resistance of an object.
- A. Meter Scale.
 - B. Test Prod
 - C. Zero Ohm Corrector
 - D. Resistance Block
7. It refers to the block of the multi-tester when measuring the resistance and continuity of an object.
- A. Direct Current Voltage Block
 - B. Resistance Block
 - C. Direct Current mille Ampere Block
 - D. Alternating Current Voltage Block
8. It is one of the part of multi-tester and clamp meter that need to adjust when setting the needle pointer
- A. Zero Corrector
 - B. Test Prod
 - C. Zero Ohm Adjuster
 - D. Ohms Block
9. A part of a multi tester and clamp meter need to select first to indicate what is range wants to be measured.
- A. Range Selector
 - B. Zero Corrector
 - C. Zero Ohm Adjuster
 - D. Needle Pointer
10. It is movable parts of the multi-tester and clamp meter which reflect or indicate the reading of an object
- A. Zero Ohm Adjuster
 - B. Zero Corrector
 - C. Range Selector
 - D. Needle Pointer



What Do You Need To Know?

Read the Information Sheet 1.1 very well then find out how much you can remember and how much you learned by doing Self-check 1.1.

Information Sheet 1.1

TYPES OF MEASURING INSTRUMENTS



PROTRACTOR a flat semi-circular piece of plastic or metal which is used for measuring angles



VOLTMETER an electrical instrument used to measure potential differences in voltage.



THERMOMETER a device used for measuring temperature .



ANEMOMETER an instrument for measuring the rate of airflow on motion



COMPOUND GAUGE - A device installed at the low side of the cooling system used for charging refrigerant or maybe used for troubleshooting purposes. It has two readings one for positive pressure and the other for negative vacuum .



STRAIGHT EDGE -A length of metal or wood having a straight edge used in carpentry metal works to make straight line or to check the straightness of something.



CLAMP ON AMMETER - An electrical measuring instrument used to measure current rated in amperes.



Pull Push Rule A tool used for measuring an object.



Wire Gauge A tool used to measure the size of wire will use in the job



How Much Have You Learned?

Self-Check 1.1

A. Direction: Write the letter of your answer in your answer sheet.

1. It is the tool used to measure the amount of refrigerant will put in the system.
A. clamp meter B. micrometer C. steel rule D. Gauge Manifold
2. It is a measuring instrument used to measure the airflow on motion.
A. clamp meter B. micrometer C. Anemometer D. service meter
3. It is a tool used to measure of an object
A. clamp meter B. Pull Push Rule C. steel rule D. micrometer
4. It is a very useful test instrument which can easily be set as voltmeter, ammeter and ohmmeter.
A. multi-meter B. clamp meter C. caliper D. megger
5. It is the tool used for measuring the current rated in ampere.
A. steel tape B. ammeter C. straight edge D. steel rule

B. Directions: Name the following tools shown below. Write your answer on another sheet of paper



1. _____



2. _____



3. _____



4. _____



5. _____



What Do You Need To Know?

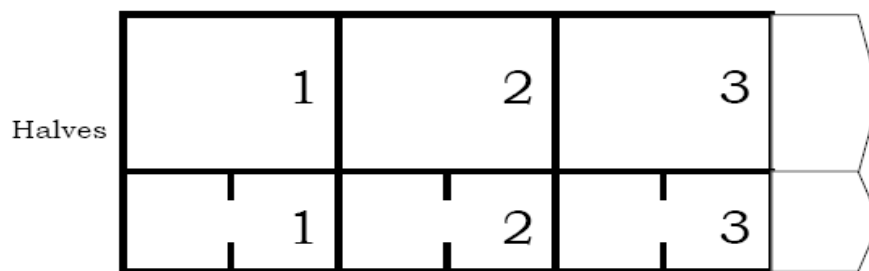
Read the Information Sheet 1.1 very well then find out how much you can remember and how much you learned by doing Self-check 1.1

Information Sheet 1.2

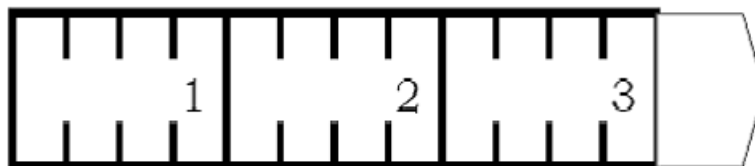
BASIC MEASURING TOOLS

Graduation on a Rule

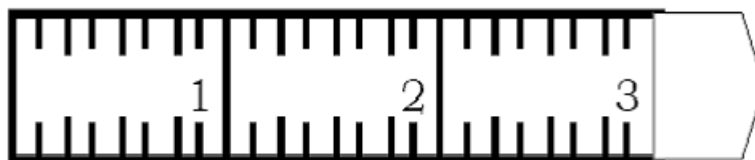
Inches



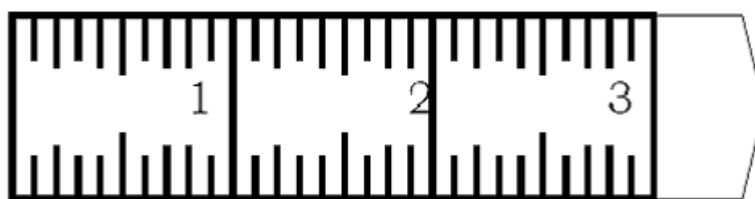
Quarters



Eight



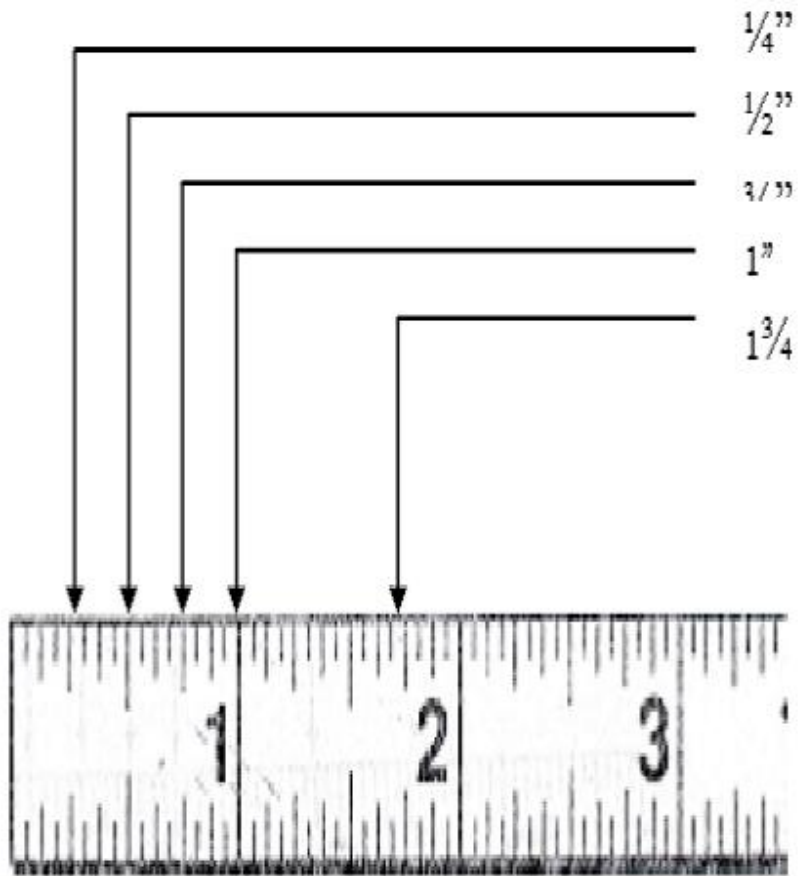
Sixteenths



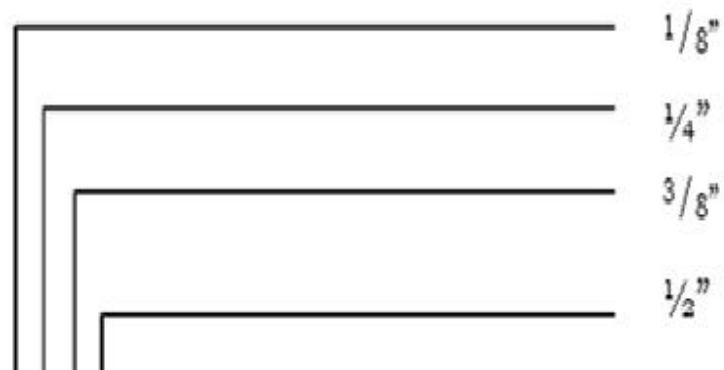
Thirty-Seconds



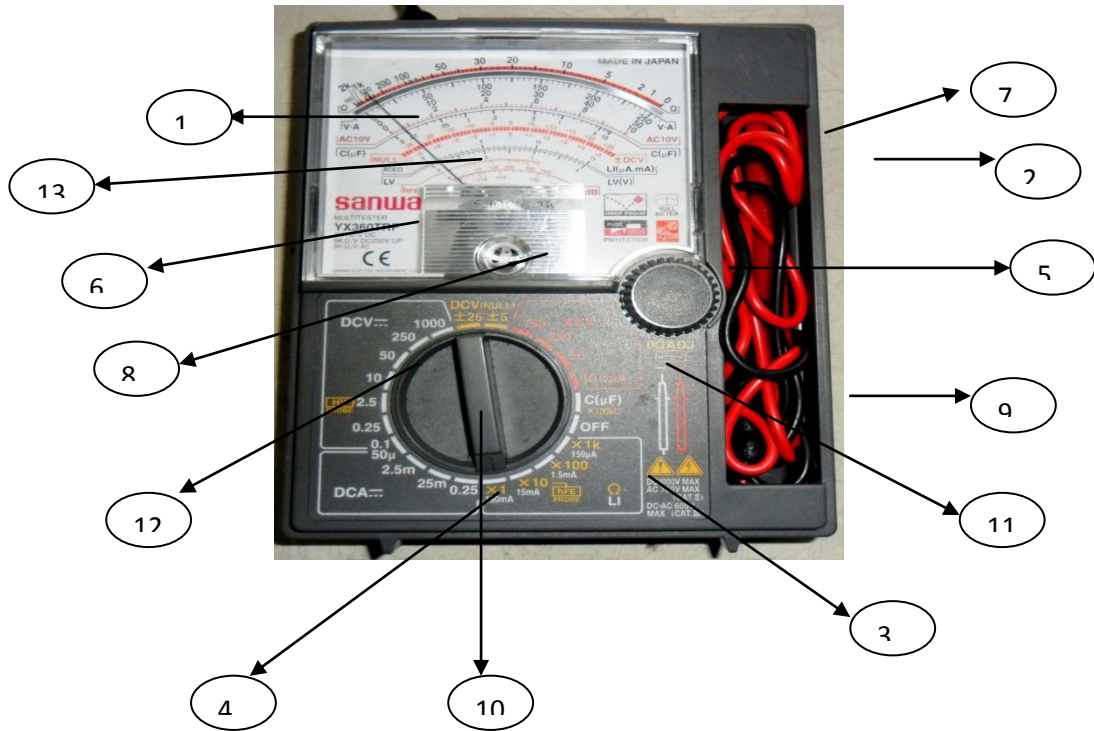
Reading Fourths on a Rule



Reading Eights on a Rule



Multi-Tester and Their Parts



1. Meter Scale
2. Test Prod Panel
3. Resistance Block
4. Direct Current mille Ampere
5. Zero Ohms Ω Corrector
6. Name Plate
7. Positive Test Prod
8. Needle Corrector
9. Negative Test Prod
10. Range Selector
11. Alternating Current Voltage Block
12. Direct Current Voltage
13. Needle Pointer

Function of each parts of a Multi-Tester

Meter scale is used to identify the amount of voltage current and resistance of the circuit being measured.

Test Prod Panel is the case of the Positive and Negative Test Prod.

Resistance block is the block that used when measuring the resistance, continuity of an object.

Direct Current mille Ampere Block – is the block used to measure the small voltage of direct Current.

Zero Ohms Ω Adjuster Knob – is the control to set into zero position the needle pointer before and after using multi-tester to attain the correctness of value.

Name Plate- is the location of the brand of the multi tester.

Positive Test Prod- is the color red terminal of the prod

Needle Corrector- is design for calibrating the needle of the test if it is not located in the infinity sign and not ranging the zero value.

Negative Test Prod- is the color black terminal of the test prod.

Range Selector- is the selector or indicator of the function of multi tester.

Alternating Current Voltage Block- is the block used when measuring the power, voltage of an object

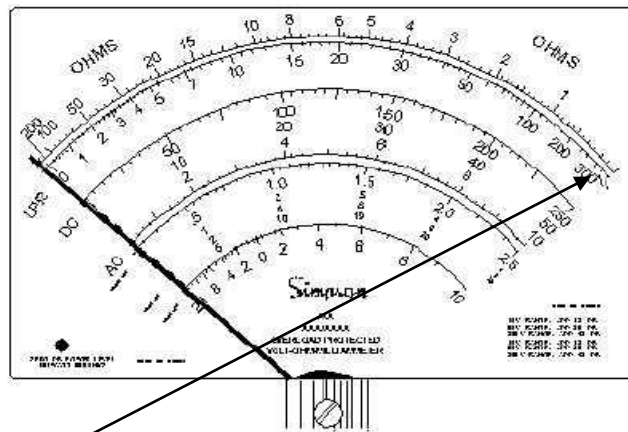
Direct Current Voltage Block- is the block where used if there is polarity will be check and commonly used in the battery.

Needle Pointer is a movable part of the multi-tester which reflects or indicates the reading.

How to read the meter scale of the multi tester

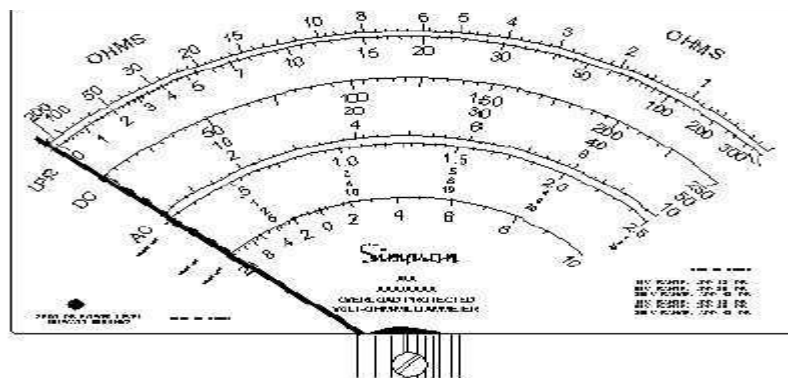
To read the resistance range of the multi tester, the given table below will be used. The unit of measurement to be used to determine its resistance is **ohm**.

Range	0-2	2-10	10-20	20-50	50-100	100-200	250-500	1K
Range x1	0.2	0.5	1	2	5	20	100	500
Range x10	2	5	10	20	50	200	2000	5000
Range x1k	20	50	100	200	500	2K	20K	50K
Range x 10k	200	500	1K	2K	5K	20K	200K	2000 K



Pointer deflection
Range setting is X1

Reading is 2.5ohms



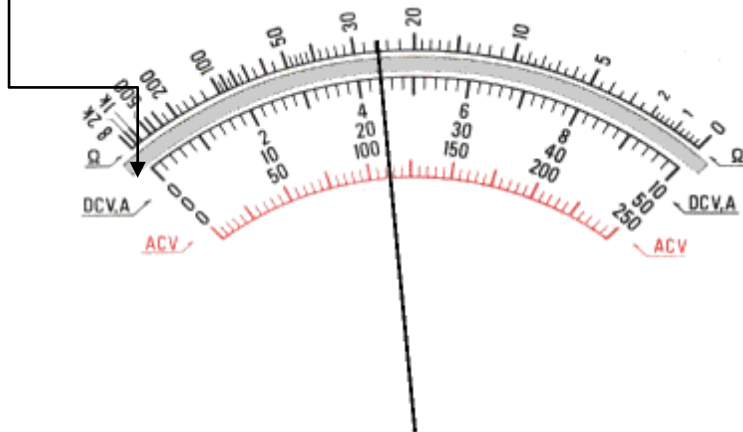
Pointer deflection
Range setting is X10

Reading is 25ohm

VOLTAGE SCALE

Range	Value/div
Range 10V	0.2V
Range 50V	1V
Range 250V	5V
Range 100V	20V

Voltage Scale

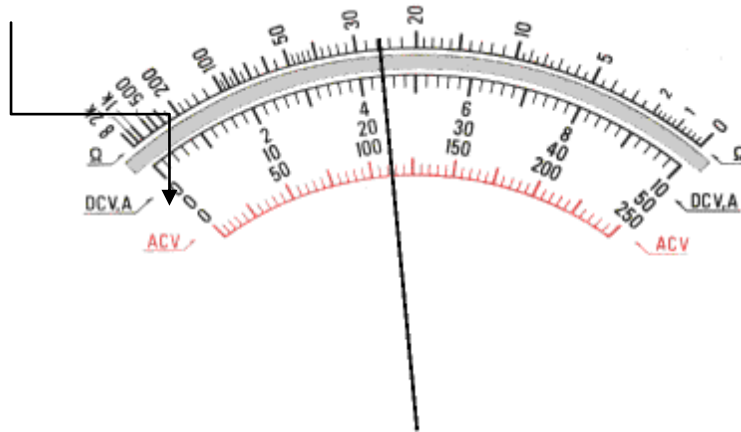


Range setting is 10 V(used 0-10 scale

Reading is 4.4V

Range	Value/div
Range 10V	0.2V
Range 50V	1V
Range 250V	5V
Range 100V	20V

Voltage Scale

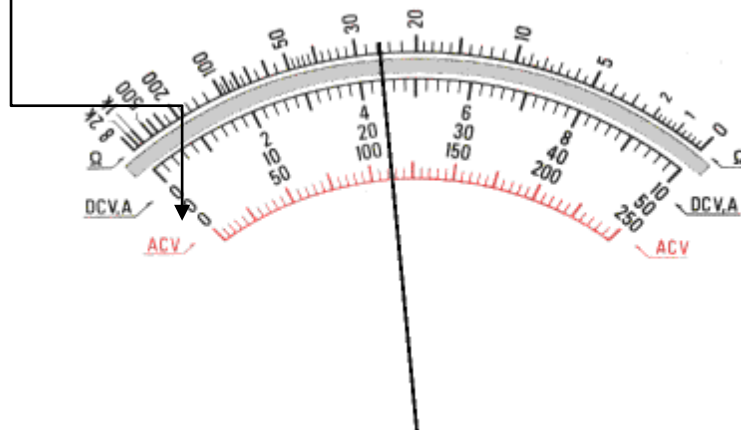


Range setting is 50V (used 0-10 scale)

Reading is 44V

Range	Value/div
Range 10V	0.2V
Range 50V	1V
Range 250V	5V
Range 1000V	20V

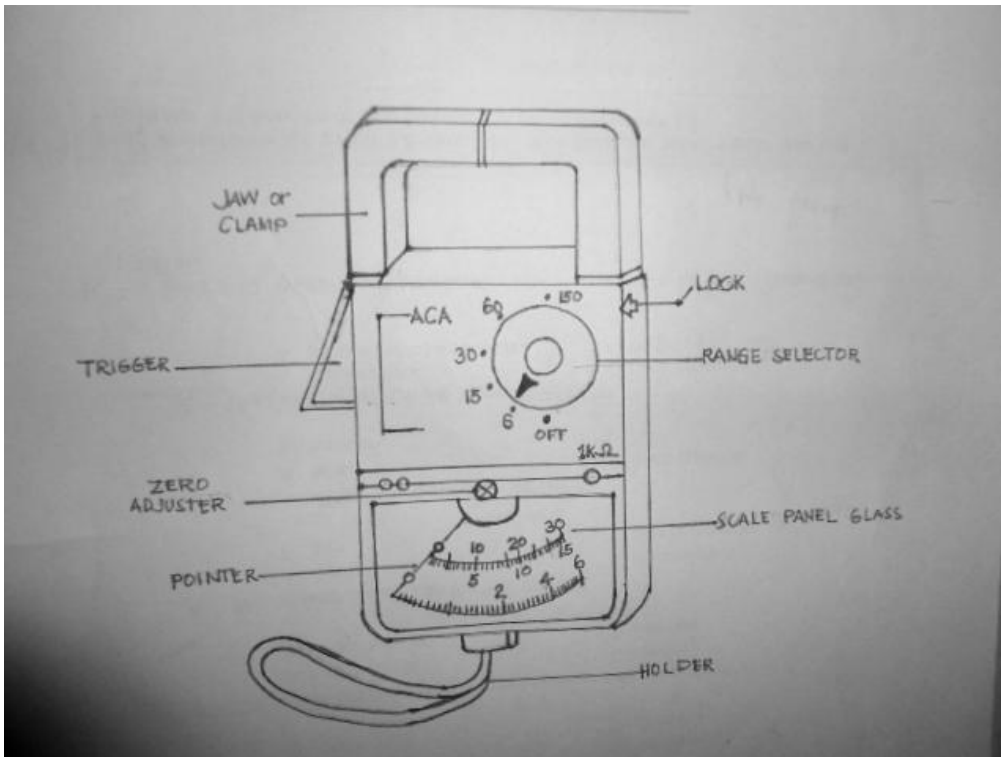
Voltage Scale



Range setting is 250V (used 0-10 scale)

Reading is 110V

CLAMP METER and each parts



Clamp Meter Parts and Function

Jaw- is the part of the clamp meter wherein there is a magnet that will reflect what is the amperage of the wire.

Trigger- is the part of the clamp meter that needs to press slightly to open the jaw.

Range Selector- is the selector that needs to set or adjust first before clamp the jaw of the clamp meter to the one (1) line of the source or power.

Zero Adjuster- is the adjustment of the clamp meter when the pointer does not reached the zero position.

Scale Panel Glass- is the indication what the amperage value of the line being measure is.

Pointer- is the indicator of the amperage.

Holder- is the lace that located at the top of the clamp meter to avoid drop.

Lock- is a part of clamp meter that use if the pointer is moving.



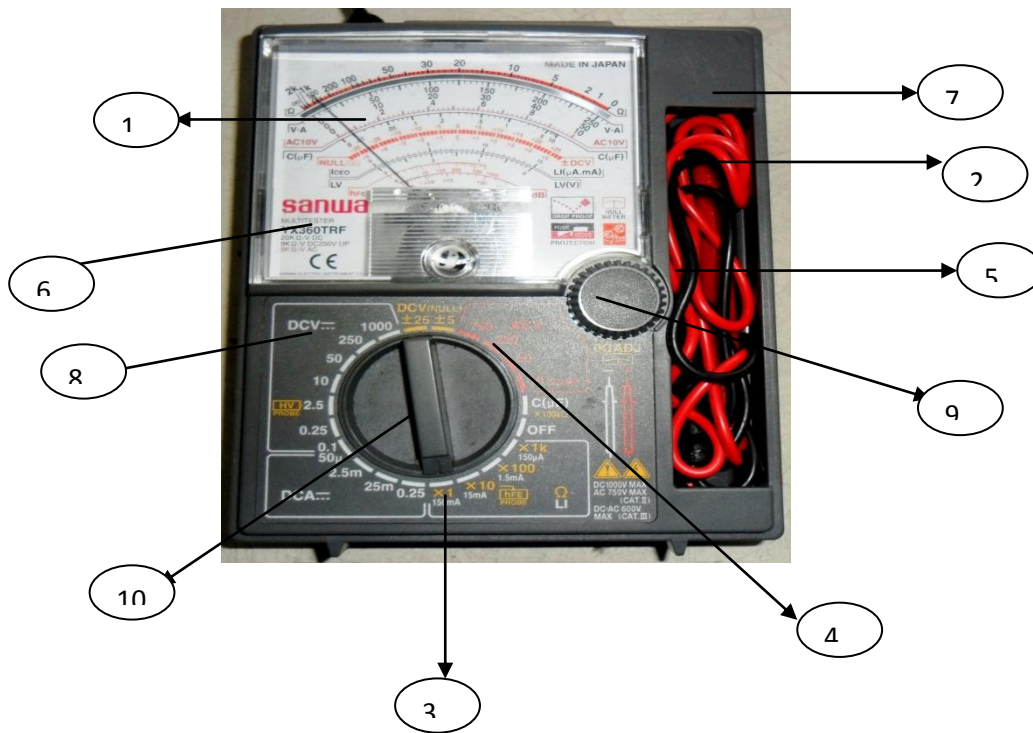
How Much Have You Learned?

Self-Check 1.2

A. MULTIPLE CHOICE. Choose the best answer. Write your answer on another sheet of paper.

1. A flat semi-circular piece of plastic or metal which is used for measuring angles.
A. Protractor
B. Thermometer
C. Compound Gauge
D. Clamp Ammeter
2. A device for measuring temperature.
A. Pull push rule
B. Anemometer
C. Clamp meter
D. Thermometer
3. A □ instrument for measuring the rate of airflow on motion.
A. Compound gauge
B. Protractor
C. Anemometer
D. Pull push rule
4. An electrical instrument used to measure potential differences in voltage.
A. Compound gauge
B. Thermometer
C. Anemometer
D. Multi-Tester
5. A tool used for measuring of an object.
A. Multi-tester
B. Clamp meter
C. Pull push rule
D. Anemometer

B. Write the name of the part of a Multi-tester



C. Write at least 7 parts of the clamp meter.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

Refer to the Answer Key. What is your score?



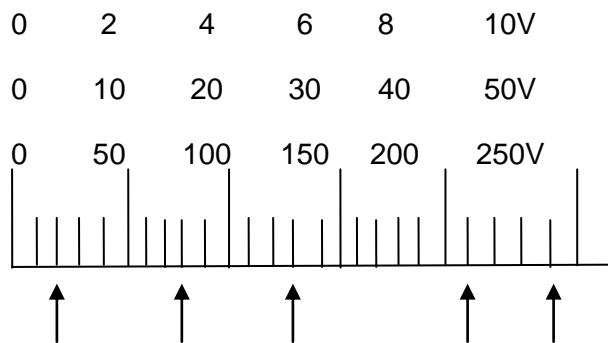
What Do You Already Know?

Let us determine how much you already know about activity sheet 2.1. Take this test.

Activity Sheet 1.2

DIRECTIONS: Using the multi tester read the given problem below. Write your answer on another sheet of paper.

A.



1. _____ 2. _____ 3. _____ 4. _____ 5. _____

No	Range 10V	Range 50V	Range 250V
1			
2			
3			
4			
5			

B. Using the clamp meter, connect the clamp meter in one line source and read the value of the following then record it into another pieces of paper.

1. REFPRIGERATOR UNIT
2. AIR CONDITION WINDOW TYPE
3. SPLIT TYPE AIR CONDITION
4. CHEST TYPE FREZZER
5. FREZZER



How Well Did You Perform?

**Find out by accomplishing the Scoring Rubric honestly and sincerely.
Remember it is your learning at stake!**

Excellence	10 to 8 - Can perform this skill without supervision and with initiative and adaptability to problem situations.
Very Satisfactory	7 to 5 - Can perform this skill satisfactorily without assistance or supervision.
Good	4 to 3 - Can perform this skill satisfactorily but requires some assistance and/or supervision.
Needs Improvement	2 to 1 - Can perform parts of this skill satisfactorily, but requires considerable assistance and/or supervision.

REMARKS:

CHECKED BY:

TEACHER IN CHARGE

LEARNING OUTCOME 2

Carry out measurements and calculations

PERFORMANCE STANDARDS

- Accurate measurements are obtained according to job requirements.
- Instruments are read to the limit of accuracy of the tool.
- Work pieces are measured according to job requirements



Materials

- **THERMOMETER**
- **REFRIGERATOR UNIT**
- **AIR CONDITION UNIT**
- **OVERLOAD PROTECTOR**
- **RELAY**
- **THERMOSTAT**



What Do You Already Know?

Let us determine how much you already know about carrying out measurements and calculations. Take this test.

Directions: Read the questions carefully. Choose the letter of the correct answer and write it on a separate sheet of paper.

- 1.. A figure having four sides of equal length and four right angles
 - A. Square
 - B. Rectangle
 - C. Circle
 - D. Triangle
- 2.. A flat, round figure formed by one curved line, all points of which are equidistant from center point
 - A. Triangle
 - B. Square
 - C. Circle
 - D. Trapezoid
- 3.. A figure having no right angles and four sides of equal length
 - A. Rectangle
 - B. Rhombus
 - C. Square
 - D. Circle
- 4.. A figure having three sides and three angles
 - A. Circle
 - B. Trapezoid
 - C. Square
 - D. Triangle
5. A figure with only one pair of parallel opposite sides.
 - A. Trapezoid
 - B. Rhombus
 - C. Parallelogram
 - D. Rectangle
6. A figure such as a square, rectangle or rhombus with two parallel ends of equal length and two parallel sides of equal length
 - A. Rhombus
 - B. Circle
 - C. Parallelogram
 - D. Triangle
7. It is equal to $\frac{1}{360}$ of a circle
 - A. Degree
 - B. Arc
 - C. Radius
 - D. Circumference
- 8 It is equal to twelve inch (12") or one-third $\frac{1}{3}$ of a yard ($\frac{1}{3}$ yard)
 - A. Inch
 - B. Foot
 - C. Centimeter
 - D. Meter
9. one (1) inch is equal to _____ centimeter
 - A. 8 cm
 - B. 4 cm

- C. 2.54 cm
D. 6 cm
10. 10 mm is equal to _____ inch
- A. 0.03937 inch
B. 0.45673 inch
C. 0.23514 inch
D. 0.85349 inch



What Do You Need To Know?

Read the Information Sheet 1.1 very well then find out how much you can remember and how much you learned by doing Self-check 1.1.

Information Sheet 2.1

LINEAR MEASUREMENT (International System)

Metric System Basic Measurement

LINEAR MEASURE

1 Centimeter	=	10 Millimeters
1 Decimeter	=	10 Centimeters
1 Meter	=	10 Decimeters
1 Decameter	=	10 Meters
1 Hectometer	=	10 Decameter
1 Kilometer	=	1000 Meters

SQUARE MEASURE (AREA)

1 Sq. Centimeter	=	100 Sq. Millimeters
1 Sq. Meter	=	10,000 Sq. Centimeters
1 Acre	=	100 Sq. Meters
1 Hectare	=	100 Acres
	=	10,000 Sq. Meter
1 Sq. Kilometer	=	100 Hectares
	=	1,000,000 Sq. Meters

CUBIC MEASURE (VOLUME)

1 Cubic Centimeter	=	1000 Cu. Millimeters
1 Cubic Decimeters	=	1000 Cu. Centimeters
1 Cubic Meter	=	1000 Cu. Decimeters

CAPACITY MEASURE (LIQUID)

1 Centiliter	=	10 Milliliters
1 Deciliter	=	10 Centiliters
1 Liter	=	10 Deciliters
1 Deciliter	=	10 Liters
1 Hectoliter	=	10 Deciliters
1 Kiloliter	=	10 Hectoliters
	=	100 Liters

METRIC CONVERSION IN TERMS OF LINEAR MEASUREMENT

1 inch	=	25.400 millimeters
1 mm	=	0.03937 inch
1 inch	=	2.54 cm
1 cm	=	0.3937 inch
1 foot	=	12 inches
1 inch	=	0.08333 foot
1 foot	=	0.333 yard
1 yard	=	3 feet
1 foot	=	0.30481 meter
1 meter	=	3.2809 feet
1 yard	=	36 inches

- 1 yard = 91.44 centimeters
- 1 centimeter = 0.9144 meter
- 1 meter = 1.0936 yards
- 1 statute = 5280 feet
- 1 kilometer = 3281 feet
- 1 foot = 12 inches
- 1 rod = 165 feet
- 1 mile = 5280 feet
- 1 meter = 39.37 inches
- 10 millimeters = 1 centimeter
- 10 centimeters = 1 decimeter
- 10 decimeters = 1 meter
- 1000 meters = 1 kilometer = 3,281 ft.
- 100 hectometer = 1 kilometer = 3,281 ft.

LINEAR CONVERSION TABLE

Inch		Centimeter
0.3937	1	2.5399
.7874	2	5.0799
1.1811	3	7.6199
1.5748	4	10.1599
1.9685	5	12.6999
2.3622	6	15.2399
2.7559	7	17.7799 8
3.1496	8	20.3199
3.5433	9	22.8599

Feet	Centimeter
------	------------

3.2808	1	0.3048
6.5617	2	.6069
9.8425	3	.9144
13.1234	4	1.2192
16.4042	5	1.5240
19.6850	6	1.8288
22.9658	7	2.1336
26.2467	8	2.4384
29.5275	9	2.7432

Feet		Centimeter
1.0936	1	0.9144
2.1872	2	1.8288
3.2808	3	2.7432
4.3744	4	3.6576
5.4681	5	4.5720
6.5616	6	5.4864
7.6553	7	6.4008
8.7489	8	7.3152
9.8425	9	8.2296

METRIC CONVERSION IN TERMS OF SQUARE MEASURE

1 sq. in.	=	6.4516 sq. cm.
1 sq. cm.	=	0.15500 sq. ft.
1 sq. ft.	=	144 sq. in.
1 sq. in.	=	0.0094 sq. ft.

1 sq. ft.	=	929.03 sq. cm.
1 sq. cm.	=	0.00180 sq. ft.
1 sq. ft.	=	0.092903 sq. m.
1 sq. m.	=	10.764 sq. ft.
1 sq. yd	=	9 sq. ft.
1 sq. ft.	=	0.1111 sq. yd.
1 sq. yd	=	0.83612 sq. m.
1 sq. m.	=	1.196 sq. yd.
640 acres	=	1 sq. mile
30-1/4 sq. yd.	=	1 sq. pole
40 sq. pole	=	1 rod
1 rod	=	1 acre 9

AREA

Square Inch		Square Centimeter
0.1550	1	6.4515
0.3100	2	12.9030
0.4650	3	19.3545
0.6200	4	25.8060
0.7750	5	32.2575
0.9300	6	38.7090
1.0850	7	45.1605
1.2400	8	51.6120
1.3950	9	58.0635

Square Feet		Square Meter
10.7638	1	0.0930

21.5276	2	0.1860
32.2914	3	0.2790
43.0552	4	0.3720
53.8190	5	0.4650
64.5828	6	0.5580
75.3466	7	0.6510
86.1104	8	0.7440
96.8742	9	0.8370

Square Yard

Square Meter

1.1960	1	0.8361
2.3920	2	1.6723
3.5880	3	2.5084
4.7840	4	3.3445
5.9800	5	4.1806
7.1760	6	5.0168
8.3720	7	5.8529
9.5680	8	6.6890
10.7640	9	7.525210

Cubic Inch

Cubic Centimeter

0.0610	1	16.3871
0.1220	2	32.7742
0.1830	3	49.1613
0.2440	4	65.5484
0.3050	5	81.9355

0.3660	6	98.3226
0.4270	7	114.7097
0.4880	8	131.0968
0.5490	9	147.4839

Cubic Feet

Cubic Meter

35.3145	1	0.0283
70.6289	2	0.0566
105.9434	3	0.0850
141.2578	4	0.1133
176.5723	5	0.1416
211.8867	6	0.1699
247.2042	7	0.1982
282.5156	8	0.2266
317.8301	9	0.2550

WEIGHT CONVERSION IN METRIC SYSTEM

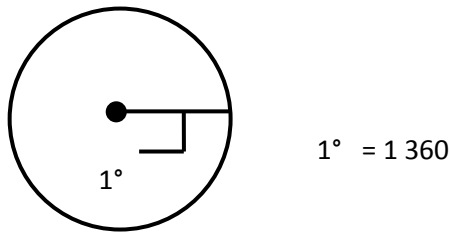
1 Kilogram	=	100 Grams
	=	2.205 Pounds
1 Hectogram	=	10 Grams
	=	3.527 Ounces
1 Gram	=	0.035 Ounce
1 Centigram	=	0.01 Gram
	=	.154 Grain (Troy)
1 Milligram	=	0.001 Gram (gr.)
	=	0.015 Grain (Troy)
1 Ounce	=	28.35 Grams

1 Gram	=	0.03537 Ounce (oz.)
1 Ounce	=	0.2835 Kilogram (kg.)
1 Kilogram	=	35.274 Ounces.
1 Pound	=	16 Ounces
1 Ounce	=	0.0625 Pounds
1 Pound	=	453.6 Grams
1 Gram	=	0.002205 Pounds
1 Pound	=	.4536 Joules Gram

Unit of Measure and their Equivalents:

- a. Inch (") - Equal to one-twelfth of a foot ($1/12$) or one thirty-sixth of a yard ($1/36$ yard)
- b. Foot (') - Equal to twelve inches (12") or one-third of a yard ($1/3$ yard)
- c. Yard - Equal to three feet (3') or thirty-six inches (36")
- d. Rod - Equal to sixteen and one-half feet ($16\frac{1}{2}$)
- e. Mile - Equal to five thousand, two hundred and eighty feet (5280")
- f. Degree ($^{\circ}$) - Equal to $1/360$ of a circle 1°

Example:



ALTERNATIVE MEASURING TOOLS

1. Meter stick for pull-push rule
2. Foot rule for steel rule
3. Protractor for wing divider or compass
4. Pull-push rule for tape measure
5. Digital Weighing Scale for arm balance
6. Clamp Ammeter for multi-tester

LET US REMEMBER

Proper selection of measuring instruments can help and facilitates measurement easily. It can also avoid loss of time and effort in performing a task or activity.



How Much Have You Learned?

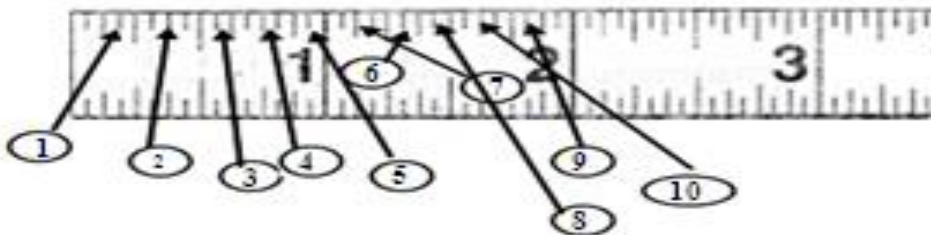
Self-Check 2.1

Directions: Compute the follow problems below. Write your answer on another sheet of paper

A. CONVERSION FACTOR. Convert the following Metric units of measurement to English units or vice versa

1. 10 Dm \longrightarrow M
2. 18 M \longrightarrow Cm
3. 12 inch \longrightarrow mm
4. 13 Cu. Meter \longrightarrow Cu. Centimeter
5. 35 Dm \longrightarrow mm

II. Write the corresponding value of Graduation in metric rule(inch)





What Do You Need To Know?

Read the Information Sheet 2.1 very well then find out how much you can remember and how much you learned by doing Self-check 2.1.

Information Sheet 2.1

Types of Geometric Figures

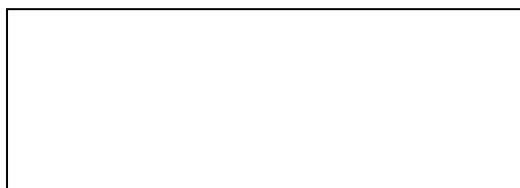
a. Square - A figure having four sides of equal length and four right angles

Example:



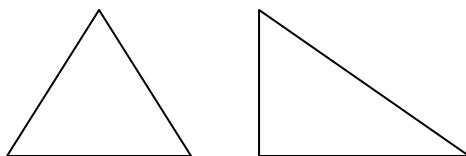
b. Rectangle - A figure with two parallel ends of equal length, two parallel sides of equal length, and four right angles.

Example:

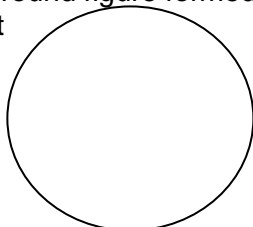


c. Triangle - A figure having three sides and three angles

Example:



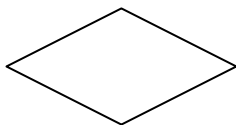
d. Circle - A flat, round figure formed by one curved line, all points of which are equidistant from center point



Example:

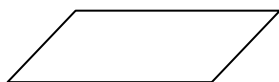
e. Rhombus - A figure having no right angles and four sides of equal length

Example:



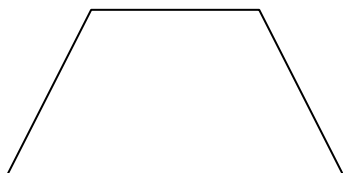
f. Parallelogram - A figure such as a square, rectangle or rhombus with two parallel ends of equal length and two parallel sides of equal length.

Example:



g. Trapezoid - A figure with only one pair of parallel opposite sides.

Example:





How Much Have You Learned?

Self Check 2.1

Directions: Using geometric figure, draw the following component and parts of Ref and air condition. Do this in Oslo Paper.

1. Overload Protector
2. Thermostat
3. Relay
4. Condenser
5. Evaporator
6. Motor Compressor
7. Bulb
8. Accumulator
9. Blower Fan
10. Filter Drier



How Well Did You Perform?

**Find out by accomplishing the Scoring Rubric honestly and sincerely.
Remember it is your learning at stake!**

Excellence	10 to 8 - Can perform this skill without supervision and with initiative and adaptability to problem situations.
Very Satisfactory	7 to 5 - Can perform this skill satisfactorily without assistance or supervision.
Good	4 to 3 - Can perform this skill satisfactorily but requires some assistance and/or supervision.
Needs Improvement	2 to 1 - Can perform parts of this skill satisfactorily, but requires considerable assistance and/or supervision.

REMARKS:

CHECKED BY:

TEACHER IN CHARGE



What Do You Need To Know?

Read the Information Sheet 2.2 very well then find out how much you can remember and how much you learned by doing Self-check 2.2.

Information Sheet 2.2



measures
heat level

does not
heat in a substance. It indicates the degree of warmth, hotness or coldness of the
substance.

In the molecular theory of heat, temperature indicates the speed of motion of the
molecules. It is important not to use the words "heat" and "temperature" carelessly.

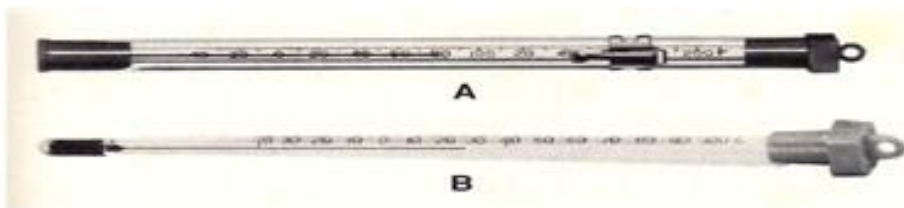
Temperature measures the speed of motion of the atom. Heat is the thermal energy
of the atom multiplied by the number of atoms.

For example, a small copper dish weighing a few grams, heated to 1340°F (727°C) does not
contain as much heat as 5 kilograms of copper heated to 284°F (140°C). However, its heat
level is higher. Its intensity of heat is greater.

The U.S. conventional unit of temperature is the degree Fahrenheit. The SI unit of
temperature is the Kelvin (K). The temperature intervals (space between degrees) on the
Kelvin scale are the same as Celsius.

Temperature is measured with a thermometer. This is usually through uniform
expansion of a liquid in a sealed glass tube. There is a bulb at the bottom of the tube and a
quantity of liquid (mercury or alcohol) inside.

The glass does not expand or contract as much as the liquid during a temperature
change.
liquid
and fall
tube as

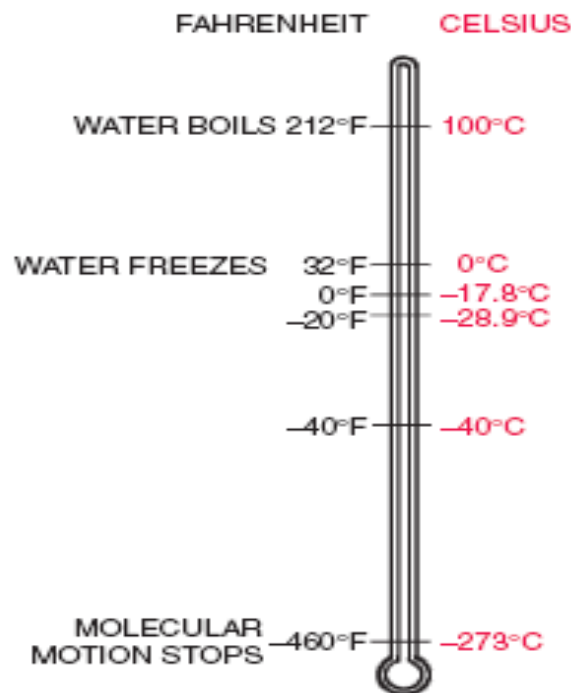


The
will rise
in the
the

temperature changes. The tube is "calibrated" or marked off in degrees using the desired
temperature scale.

Fig. 1. shows a glass stem thermometer used in refrigeration and air conditioning work

Thermometer-pyrometer - Another type of thermometer measurement instrument. The term “pyrometer” means high temperature. This instrument has a digital scale. It has the capability of measuring from -40°F (-40°C) to 1999°F (1100°C). It is used when accurate readings at various temperatures are needed. It will indicate the temperature in about 2-10 seconds



THERMOMETER SCALES – FAHRENHEIT AND CELCIUS

The two most common thermometer scales are the Fahrenheit and the Celsius Scales. Celsius is sometimes called the Centigrade scale. The Celsius scale is named in honor of Andre Celsius, the Swedish astronomer who recommended the new system.

Two temperatures that determine the calibration of a thermometer:

- the temperature of melting ice
- the temperature of boiling water

Both must be at a pressure of 1 atmosphere at sea level.

On the Fahrenheit thermometer, the temperature of melting ice is 32°F. The temperature of boiling water is 212°F. This provides 180 spaces or degrees between the freezing and boiling temperatures.

On the Celsius thermometer, the temperature of melting is 0°C. The temperature of boiling water is 100°C. There are 100 spaces or degrees on the scale between freezing and boiling.

TEMPERATURE CONVERSION

It is often necessary to convert a temperature from one scale to another.

Formulas have been developed for this purpose.

°C means temperature in degrees Celsius.

°F means temperature in degrees Fahrenheit .

K means temperature in degrees Kelvin.

To convert from one of these scales to another, follow the procedure outline in the following examples.

Degrees Celsius to Degrees Fahrenheit

Formula:

Temperature in °F = $(180/100 \times \text{temperature } ^\circ\text{C}) + 32$
or Temperature in °F = $(9/5 \times ^\circ\text{C}) + 32$

Example:

Convert 75°C to °F

Solution:

$$^{\circ}\text{F} = (9/5 \times 75) + 32$$

$$^{\circ}\text{F} = (1.8 \times 75) + 32$$

$$^{\circ}\text{F} = 135 + 32$$

$$^{\circ}\text{F} = 167^{\circ}\text{F}$$

Degrees Fahrenheit to Degrees Celsius

Formula:

$$\text{Temperature in } ^{\circ}\text{C} = 100/180 \times (\text{Temperature } ^{\circ}\text{F}-32)$$

$$\text{Or Temperature } ^{\circ}\text{C} = 5/9 \times (^{\circ}\text{F} - 32)$$

Example:

Convert 212^oF to O ^oC.

Solution:

$$^{\circ}\text{C} = 5/9 \times (212-32)$$

$$^{\circ}\text{C} = 5/9 \times 180$$

$$^{\circ}\text{C} = .56 \times 180$$

$$^{\circ}\text{C} = 100^{\circ}\text{C}$$

Degrees Fahrenheit to Degrees Rankine (Fahrenheit absolute)

Formula:

$$\text{Temperature in } ^{\circ}\text{R (FA)} = ^{\circ}\text{F} + 460$$

Example:

Convert 40^oF to ^oR (FA) .

Solution:

$$^{\circ}\text{R (FA)} = 40 + 460$$

$$^{\circ}\text{R (FA)} = 500 ^{\circ}\text{R (FA)} .$$

Degrees Rankine to Degrees Fahrenheit

$$\text{Temperature in } ^{\circ}\text{F} = \text{OR} - 460$$

Example:

Convert 180^oR to ^oF.

Solution:

$$^{\circ}\text{F} = 180-460$$

$$^{\circ}\text{F} = 280 ^{\circ}\text{F} 24$$

Degrees Celsius to Kelvin

Formula:

$$\text{K} = ^{\circ}\text{C} + 273$$

Example:

Convert – 10OC to K.

Solution:

$$\text{K} = -10 + 273$$

$$\text{K} = 263\text{K}$$

Kelvin to Degrees Celsius

Formula:

Temperature in °C-K-273

Example:

Convert 400K to OC.

Solution:

$$^{\circ}\text{C} = 400 - 273$$

$$^{\circ}\text{C} = 127 ^{\circ}\text{C}$$

Degrees Rankine to Kelvin

Formula:

Temperature in K = 5/9 °R

Example:

Convert 180OR to K.

Solution:

$$\text{K} = 5/9 \times 180$$

$$\text{K} = 101 \text{ K}$$

Kelvin to Degrees Rankine

Formula:

Temperature °R = 9/5 K

Example:

Convert 263 K to °R .

Solution:

$$^{\circ}\text{R} = 9/5 \times 263$$

$$^{\circ}\text{R} = 473 ^{\circ}\text{R} 25$$

Specific Heat

The specific heat of a substance is the amount of heat need to raise the temperature of one pound of the substance to one degree Fahrenheit. Not all substances have the same specific heat.

Items	Specific Heat, Btu per lbs
Most fruits and vegetables	0.92
Meat:	
Beef	0.77
Fish,Poultry	0.82
Lamb, Pork	0.66
Dairy product:	
Milk	0,92
Butter	0.64
Eggs	0.76

Formula:

$$Q=W \times S (t_2 -t_1)$$

Where Q= Heat.BTU

W= Weight, LBS

S= Specific Heat, BTU/lbs

T2= Final temperature

T1= Initial temperature

Example

1. How much heat must be removed from 750 lbs. of butter to cool it from 98° F to 34° F.

Solution

$$Q = W \times S (t_2 - t_1)$$

$$= 750 \text{ lbs.} \times 0.64 \text{ Btu/ lbs.} \times (34^\circ - 98^\circ)$$

$$= - 30,720 \text{ Btu of heat ANS}$$



How Much Have You Learned?

Self-Check 2.2

Directions: Use the Table below, and compute how much heat required changing the temperature of any substance. Write your answer to another sheet of paper.

Items	Specific Heat, Btu per lbs
Most fruits and vegetables	0.92
Meat:	
Beef	0.77
Fish,Poultry	0.82
Lamb, Pork	0.66
Dairy product:	
Milk	0.92
Butter	0.64
Eggs	0.76

Formula:

$$Q=W \times S (t_2 -t_1)$$

Where Q= Heat.BTU

W= Weight, LBS

S= Specific Heat, BTU/lbs

T2= Final temperature

T1= Initial temperature

- How much heat must be removed from 379 lbs. of grape to cool it from 93°F to 29°F.
- How much heat must be removed from 939 lbs. of fish to cool it from 120°F to 39°F.
- How much heat must be removed from 451 lbs. of beef to cool it from 150°F to 70°F.
- How much heat must be removed from 640 lbs. of pork to cool it from 113°F to 75°F.
- How much heat must be removed from 240 lbs. of chicken to cool it from 528°F to 52°F.
- How much heat must be removed from 928 lbs. of egg to cool it from 85°F to 35°F.
- How much heat must be removed from 490 lbs. of butter to cool it from 90°F to 48°F.
- How much heat must be removed from 379 lbs. of cabbage to cool it from 83°F to 30°F.
- How much heat must be removed from 379 lbs. of carrot to cool it from 75°F to 15°F.
- How much heat must be removed from 329 lbs. of lamb to cool it from 85°F to 20°F.



How Do You Apply What You Have Learned?

Show that you learned something by doing this activity

Activity Sheet 2.2

Directions: Using the thermometer measure the body temperature of 10 of your classmates.

Fill up the table below. Put check (✓) under remarks on their body condition.

Name of Student	Year and Section	Body Temperature	Remarks		
			Hot	Normal	Cold
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Legend: The Body Normal condition is 37.5°Celsius.

Above 37.5°Celsius is a hot Temperature.

Below 37.5°Celsius is cold Temperature.



What Do You Need To Know?

Read the Information Sheet 1.1 very well then find out how much you can remember and how much you learned by doing Self-check 1.1.

Information Sheet 2.3

MEASURING WORK PIECES

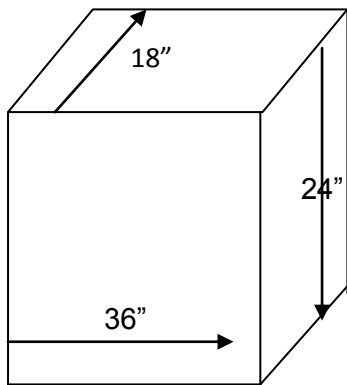
How do you get the known motor horsepower by using the cross reference table?

Cross Reference Table on Electrical Characteristics of Motor

H.P.	Cu. Ft.	Motor Terminals (Ohms)	
		Run Winding	Start Winding
1/10	3 to 4	21	75
1/8	4.5 to 6	27	63
1/6	7.5 to 8	21	65
1/5	10 to 12	11	44
1/4	14 to 20	9.7	49
1/3	Over 20	5.9	18

The table shown above can still give you the needed information. Get the height in cubic feet of a refrigerator and after being able to determine the measurement, you can use the cross reference table if you do not know the size of the cabinet. You cannot guess or estimate when you deal with technical problem. Here's how to get the exact size of the refrigerator cabinet

Example



Refrigerator Cabinet

To find the exact size of refrigerator cabinet

Formula:

$$\text{Cu.ft.} = \frac{\text{LXWXH}}{1728 \text{ cu.in.}}$$

$$\text{Cu.ft.} = \frac{24 \times 18 \times 36}{1728 \text{ cu.in.}}$$

$$\text{Cu.ft.} = \frac{15552}{1728}$$

$$\text{Cu.ft.} = 9 \text{ Cu.ft.}$$

The answer is 9 cubic feet, The equivalent in horsepower of the refrigerator using the cross reference table shows 1/5 of 1/6 horsepower. Now, the reference table has 11 or 21 ohms running and 44 or 65 ohms starting windings.



How Much Have You Learned?

Self-Check 2.3

Directions: Read the questions carefully. Choose the letter of the best answer and write it on a separate sheet of paper.

1. _____ measures the heat intensity or heat level of substance.

- A. Fahrenheit
- B. Temperature
- C. Thermometer
- D. None of the above

2. _____ measures temperature.

- A. Thermometer
- B. Voltmeter
- C. Pyrometer
- D. Ohmmeter

3. _____ is the force per unit area.

- A. Volume
- B. Atmosphere
- C. Pressure
- D. Temperature

4. _____ is the normal pressure of the atmosphere at sea level.

- A. 15.3 psi
- B. 14.7 psi
- C. 16.8 psi
- D. 14.9 psi

5. _____ is sometimes called the Centigrade scale.

- A. Fahrenheit
- B. Celsius
- C. Heat
- D. Temperature

B. Compute the following problem. To know what is the cubic feet of the refrigerator using the formula below.

1. $L=24''$
 $W=18''$
 $H=32''$
2. $L=24''$
 $W=18''$
 $H=24''$
3. $L=24''$
 $W=18''$
 $H=40''$
4. $L=24''$
 $W=18''$
 $H=26$
5. $L=24''$
 $W=18''$
 $H=28''$

Refer to the Answer Key. What is your score?



How Well Did You Perform?

**Find out by accomplishing the Scoring Rubric honestly and sincerely.
Remember it is your learning at stake!**

Learner's Name	Date
Competency:	Test Attempt 1st 2nd 3rd

<p>Directions:</p> <p>CALL INSTRUCTOR, Ask instructor to assess your performance in the following critical task using the performance criteria below</p> <p>You will be rated based on the overall evaluation on the right side.</p>	OVERALL EVALUATION	
	Level Achieved	PERFORMANCE LEVELS
		4 - Can perform this skill without supervision and with initiative and adaptability to problem situations.
		3 - Can perform this skill satisfactorily without assistance or supervision.
		2 - Can perform this skill satisfactorily but requires some assistance and/or supervision.
		1 - Can perform parts of this skill satisfactorily, but requires considerable assistance and/or supervision.
	Instructor will initial level achieved.	

PERFORMANCE STANDARDS	Yes	No	N/A
For acceptable achievement, all items should receive a "Yes" or "N/A" response.			



Congratulations! You did a great job! Rest and relax a while then move on to the next lesson. Good luck!

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LESSON 3

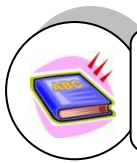
Interpret technical drawings and plans



LEARNING OUTCOMES:

At the end of this Lesson you are expected to do the following:

- LO 1. analyze signs, symbols and data; and
- LO 2. interpret work plans.



Definition of Terms

Analyze – to examine something in great detail in order to understand it better or

Block Diagram – showing the basic form or lay-out of electrical diagram in block form labeled

Blueprint – a photographic print of technical drawing with white lines and blue backgrounds.

Construct – to build or assemble something by putting together separate parts in an

Data – factual information obtain from experiments or survey. Basis for making calculation

Dimension – measurement of one or more direction such as length, width, and height.
discover more about it.

Electrical – involving electric cables or circuits powered by electricity.

Interpret – to ascribe particular meaning of significance to something.

Mechanical – a system involving the pipe lines, and mechanical component of
or drawing conclusions. Ordered way.

Pictorial Diagram – showing the basic form or lay-out of pictures of actual component.

Plan – method of doing something that is work out in advance.
Refrigeration and Air conditioning technology.

Schematic Diagram – showing the basic form or lay-out of electrical symbols.

Sign – something that indicates the rule to follow.

Symbol – something that represents abstraction
with the names of electrical components.

LEARNING OUTCOME 1

Analyze signs, symbols and data

PERFORMANCE STANDARDS

- Sign, symbols and data are determined according to classification or as appropriate in drawing.



Materials

- PLAN
- SIGN AND SYMBOLS
- PAPER
- PENCIL
- BALLPEN
- RULER
- TRIANGLE
- ERASER
- CORRECTION LIQUID
- OSLO PAPER
- SHARPENER
- COMPASS



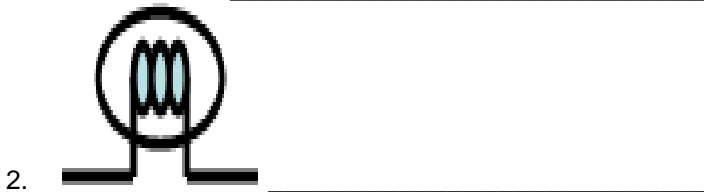
What Do You Already Know?

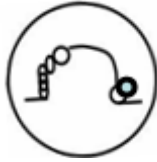
Let us determine how much you already know about Analyze Symbols and Data. .
Take this test.

Pretest LO. 1

IDENTIFICATION

Direction: Identify the electrical symbols in each item. Write your answer on the space provided before each number.





5. _____

B. True or False

Directions: Write letter T, if the statement is true, and Letter F when it is False.

- _____ 1. Motor compressor is the heart of the system.
- _____ 2. Common terminal of the motor compressor is the ending 1 of running winding and beginning 1 of the starting winding?
- _____ 3. Thermostat is the control valve to sense the temperature inside the room.
- _____ 4. Relay is electrical device connecting to the starting terminal and running terminal of the motor compressor.
- _____ 5. Overload Protector is the one who protect the too much operating of the motor compressor.




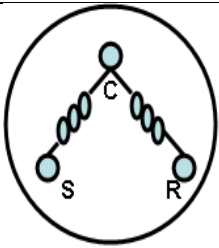


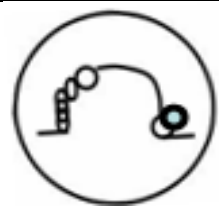


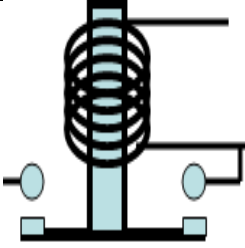




What Do You Need To Know?



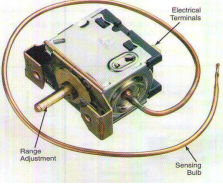
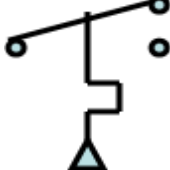

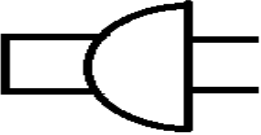

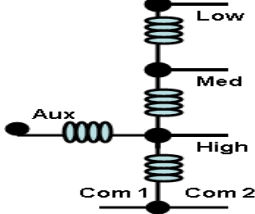

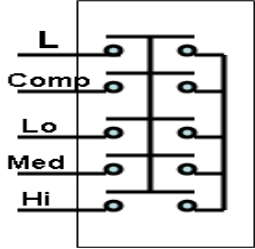

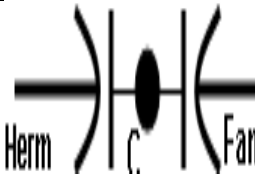
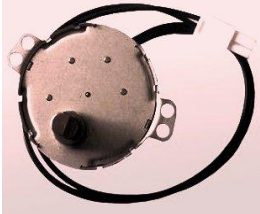
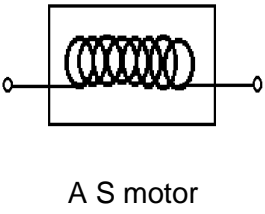
Read the Information Sheet 1.1 very well then find out how much you can remember and how much you learned by doing Self-check 1.1.

Information Sheet 1.1

This lesson contains information and learning activities on analyzing symbols and data in accordance to industry standards.

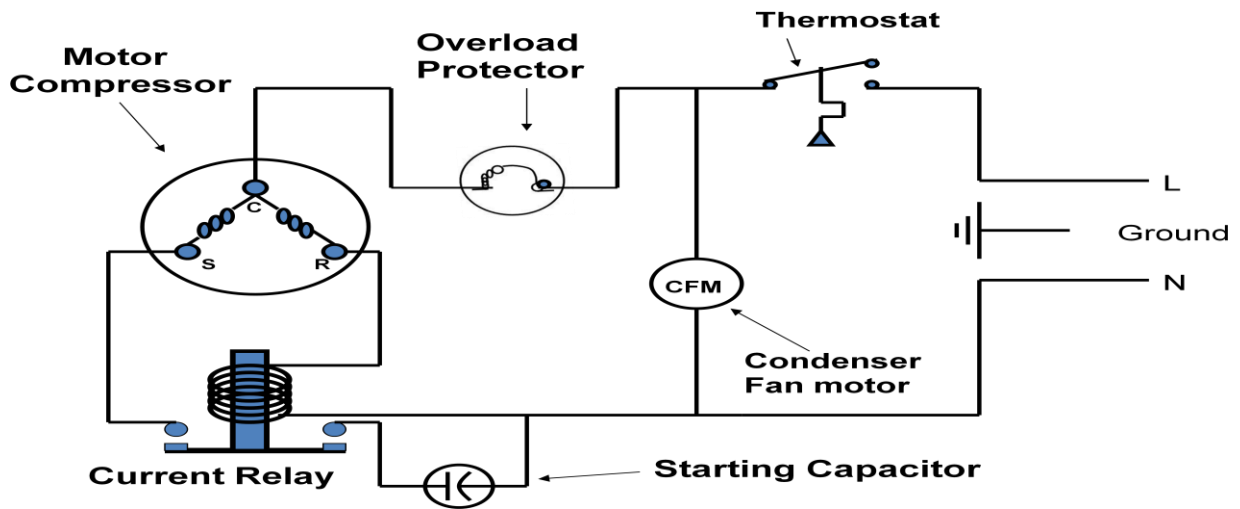
Common electrical components of domestic RAC and electrical symbols

Name of electrical component	Picture of electrical component	Electrical symbol	Block symbol
Compressor Motor			
Overload Protector			
Current Relay			
Door Switch			

Cabinet Lamp			BULB
Thermostat			TC
Plug			PLUG
Fan Motor			FM
Selector Switch			SS
Capacitor			CAP
Air Swing Motor			ASM

This diagram shows the example of symbol applied in different electrical component.

Water Cooler Electrical Wiring Diagram



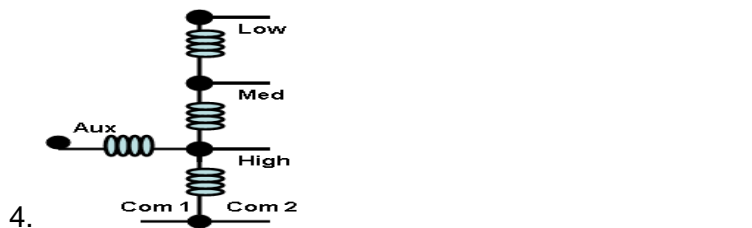
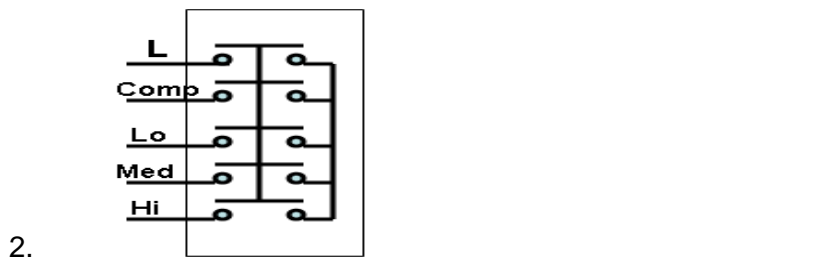
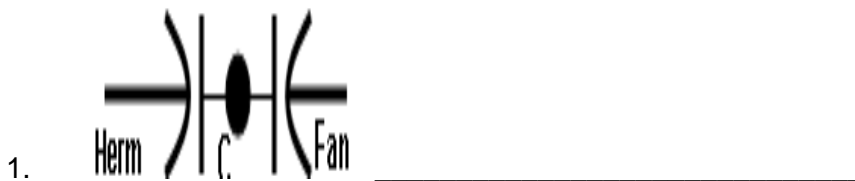


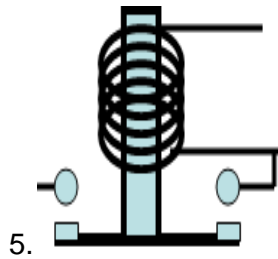
How Much Have You Learned?

Self-Check 1.1

IDENTIFICATION

Direction: Identify the electrical symbols in each item. Write your answer on the space provided.





Refer to the Answer Key. What is your score?

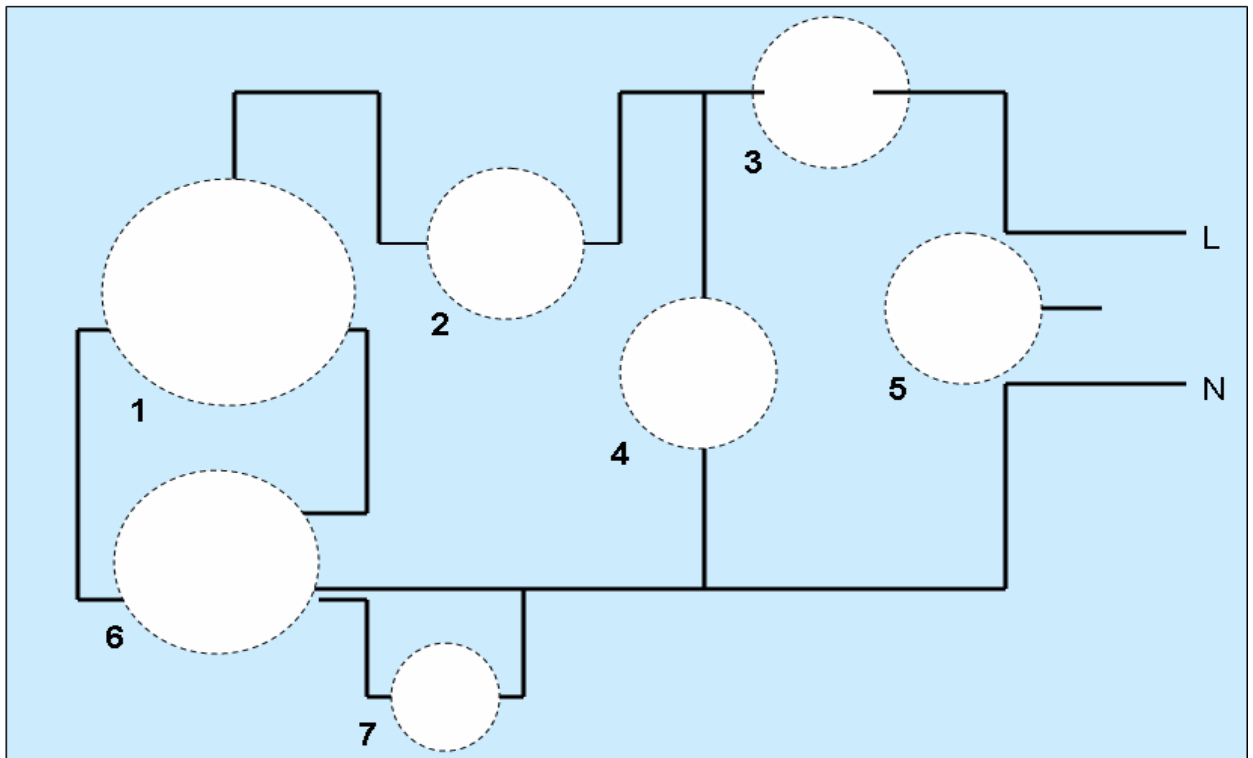


How Do You Apply What You Have Learned?

Activity Sheet 1.1

Direction: Draw the following electrical symbols to complete the block diagram below.

Water Cooler



LEARNING OUTCOME 2

Interpret work plans

PERFORMANCE STANDARDS

- Components, assemblies or object are recognized as per job requirement.
- Dimensions and specification are identified according to job requirements.



Materials

- **Electrical Symbols**
- **Blueprint**
- **Electrical Plan**
- **Mechanical Plan**
-



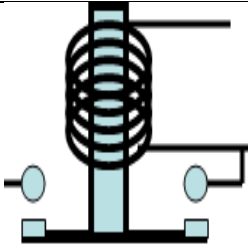
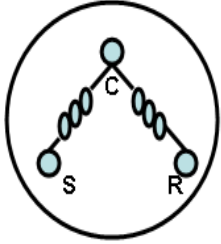









What Do You Already Know?

**Let us determine how much you already know about interpreting work plans.
Take this test.**

Pretest LO. 2

Directions: Match the following electrical symbol from column (A) to the pictures of actual component on column (B) by means of connecting lines.

Electrical symbol (A)
1. 
2. 
3. 
4. 
5. 

Picture of electrical component (B)
a. 
b. 
c. 
d. 
e. 
f. 

B. True or False.

Directions:
Write letter T if the statement is true, and letter F, if it's false.

1. Blueprint is a framework gives you a solid foundation to build your project on top of, with an easy-to-use grid, sensible typography, useful plug-in, and even a style sheet for printing.

2. Mechanical Plan is a drawing done to scale using specialized instruments showing the actual part of an object.

3. Electrical Plan is a drawing done to scale using

specialized instruments.

4. Sign and Symbol is very much important to plan of the worker.

5.Schematic Diagram is the design that follows of the technician when there is a problem encounter.



What Do You Need To Know?

Read the Information Sheet 2.1 very well then find out how much you can remember and how much you learned by doing Self-check 2.1.

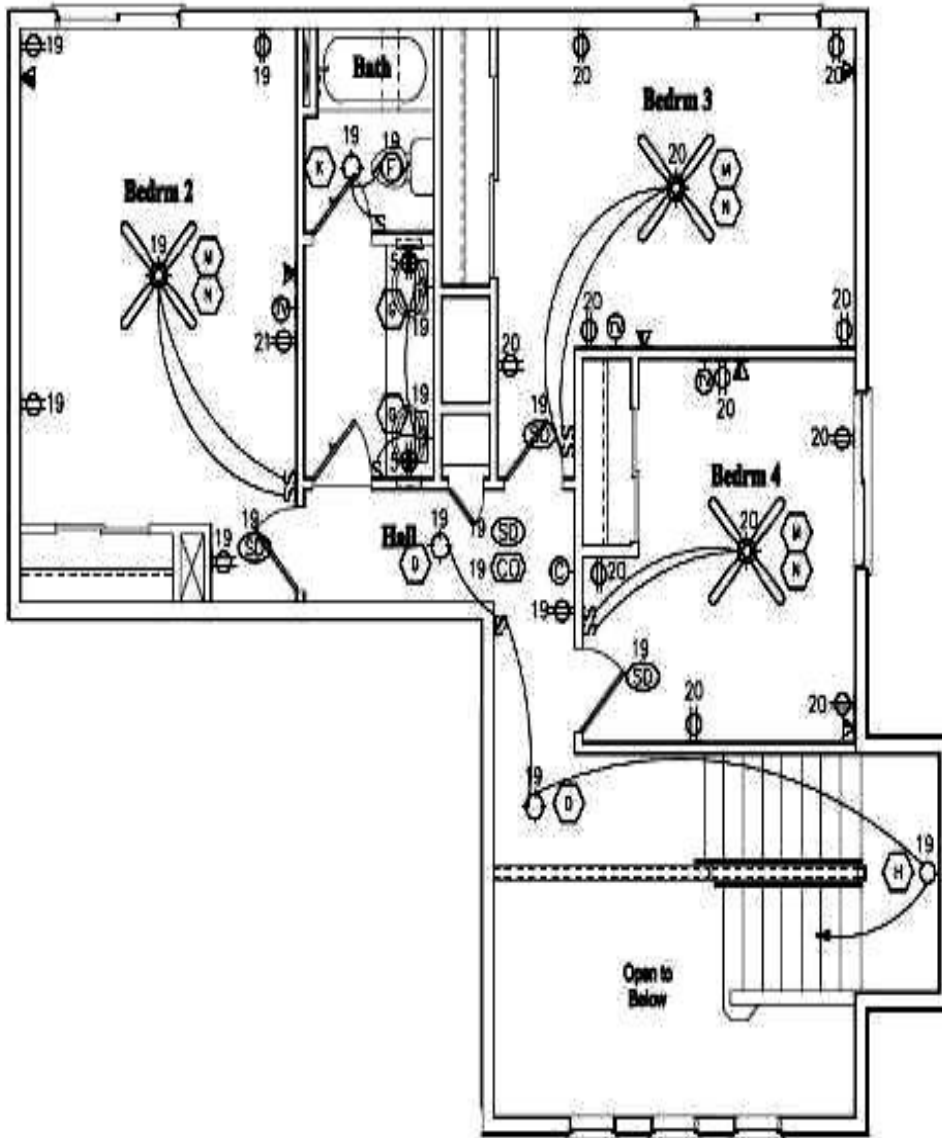
Information Sheet 2.1

Blueprint is a framework gives you a solid foundation to build your project on top of, with an easy-to-use grid, sensible typography, useful plug-in, and even a style sheet for printing.




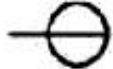











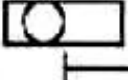



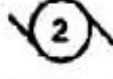






A blueprint is a type of paper-based reproduction usually of a technical drawing, and documenting an architecture or an engineering design. More Generally the term "blueprint" is used to refer to any detailed plan.

Various base materials have been used for blueprints. Paper in a common choice; for more durable prints linen was sometimes used, but with time, the linen prints would shrink slightly. To combat this problem, printing on imitation vellum and, later, polyester film (Mylar) was implemented.

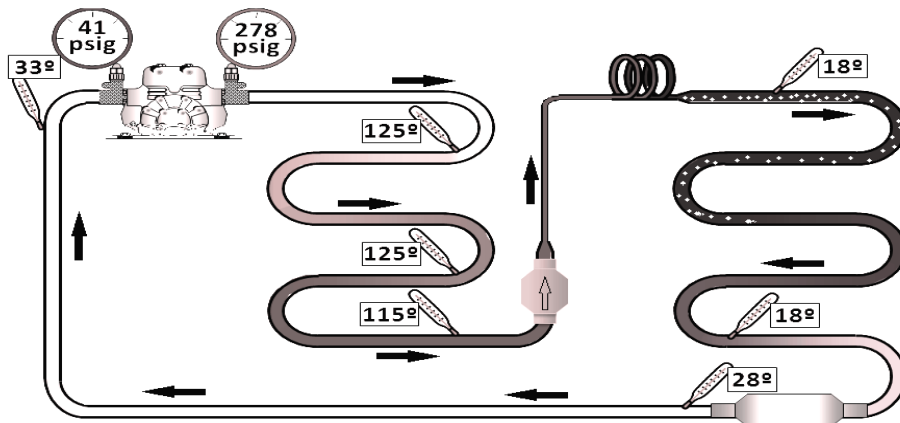
Sample of blueprint plan for installing electrical connection



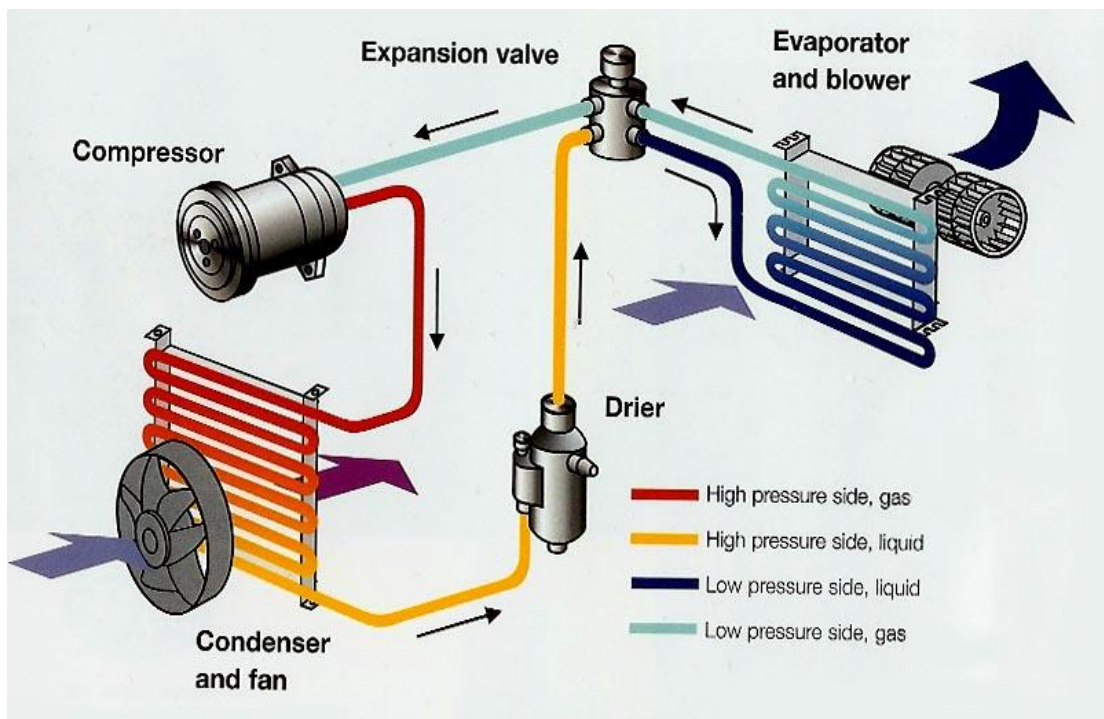
Common Electrical Symbols used in Blueprint Plan

	Electrical switchbox		Single Pole Switch
	Three-Way Switch		SinglePlex Receptacle
	Duplex Receptacle		Duplex Receptacle WP= Waterproof
	GFCI Duplex Receptacle		Isolated Ground Receptacle
	Switched Receptacle		FourPlex Four Gang Receptacle
	240-Volt Receptacle		Ceiling Mounted Light Fixture PC= Pullchain
	Wall-Mounted Light Fixture		Recessed Light Fixture
	Weatherproof Light Fixture		Fluorescent Light Fixture
	Ceiling Fan		Combination Light & Fan
	Power Vent Fan		Electric Motor Number=HP
	Smoke Detector		Circuit Breaker
	Telephone Jack		Doorbell Transformer
	Doorbell Pushbutton		Ground

Mechanical Plan- a drawing done to scale using specialized instruments showing the actual Components.



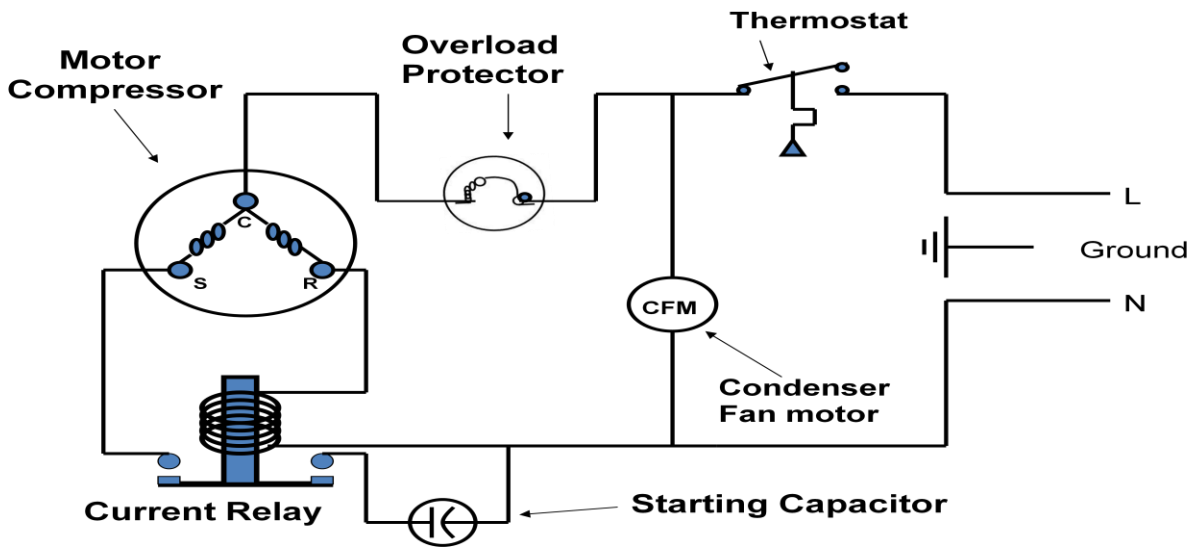
Sample of Pictorial Diagram



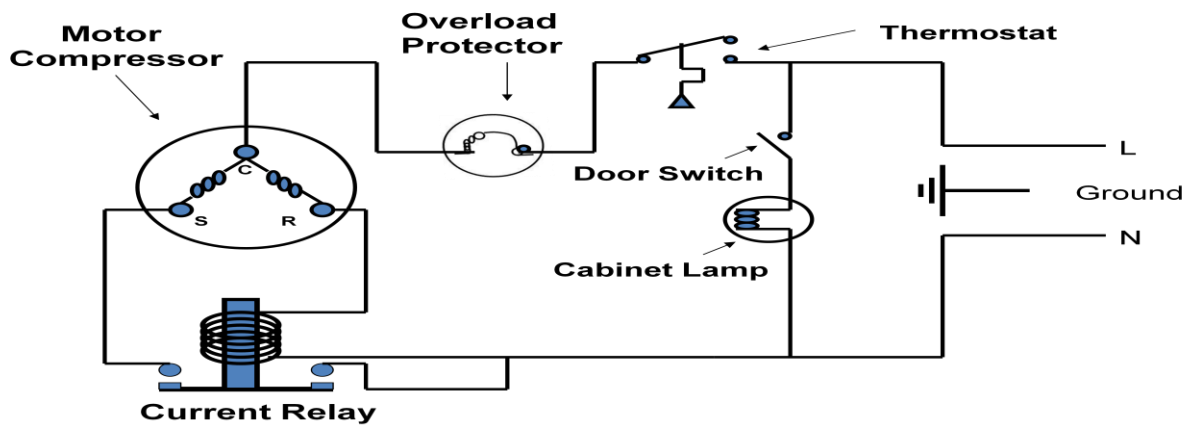
Electrical Plan- a drawing done to scale using specialized instruments showing the symbol of components.

Sample of Schematic Diagram

Water Cooler Electrical Wiring Diagram



Domestic Ref Electrical Circuit



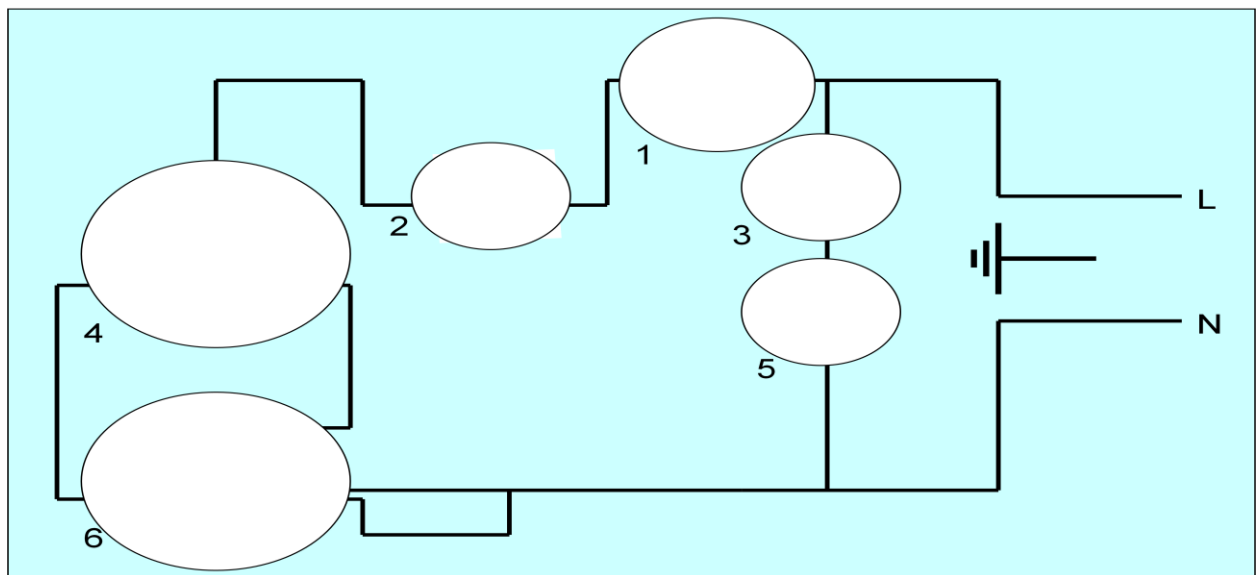


How Much Have You Learned?

Self-Check 2.1

Direction: Draw the following electrical symbols of each component to complete the Block diagram below.

Domestic Ref Electrical Circuit



Refer to the Answer Key. What is your score?



How Do You Apply What You Have Learned?

Show that you learned something by doing this activity

Activity Sheet 2.1

Direction: Make a lay-out of your own installation considering the following given:

1. 3 Rooms-1living Rooms, Two Bedrooms.
2. 3 Air-conditioning unit
3. 6 Light
4. 4 Circuit Breaker
5. 6 pcs. Convenience Outlet



Congratulations! You did a great job! Rest and relax a while then move on to the next lesson. Good luck!

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LESSON 4

Maintain Tools and Equipment



LEARNING OUTCOMES:

At the end of this Lesson, you are expected to do the following:

- LO 1. check the conditions of tools and equipment; and
- LO 2. perform basic preventive maintenance;



Definition of Terms

Accidental Hazards	occurring unexpectedly, unintentionally, or by chance. risks; dangers
Explosive	a substance, especially a prepared chemical, that explodes or causes explosion
Malfunction	to function improperly.
Obstructions	something that blocks the way
PPE	personal Protective Equipment
Technician	a person skilled in mechanical or industrial techniques or in a particular technical field
Tool kit	a small bag or box equipped with hand tools
Well- equipped	complete with necessary parts/ component
Pliers	a hand tool with two-hinged arms ending in jaws that are closed by hand pressure to grip something
Facility	something that perform a special function, work that is done regularly to keep equipment
Maintenance	buildings and grounds in good condition and working order management and upkeep of facilities according to
Housekeeping	workplace procedures and standards
Maintenance schedule	a list of allocating specific maintenance at a specific period
Equipment	device needed for a particular job or activity
Hand tool	Instrument manipulated by hand with a combination of muscle power and operator's skill
Powered hand tools	highly portable tools that are manipulated by an operator and by battery or through electricity
Specialized tools	tools designed for specific use or uses

LEARNING OUTCOME 1

Check the conditions of tools and equipment

PERFORMANCE STANDARDS

- Tools and equipment are maintained
- Non-functional tools and equipment are segregated and labeled.
- Non-functional tools are stored prior to repair.
- Safe handling of tools and equipment are applied.
- Safe working habits are observed.



Materials

- Paper
- Pencil
- Eraser
- Correction Liquid
- Multi tester
- Clamp meter
- System analyzer
- Side cutting pliers
- Long nose Pliers
- Machinist Pliers
- Philip Screw
- Flat screw
- Claw Hammer
- Hacksaw
- Tube Cutter
- Portable Electric Drill
- Bench Vise
- Vise Grip
- Tuber Bender
- Flaring Tools
- Swaging Tools
- Spirit Level
- Plumb Bob



What Do You Already Know?

Let us determine how much you already know about check conditions of tools and equipment. Take this test.

Pretest LO 1

Directions: Modified True or False.

A. Write letter T if the statement is TRUE, and letter F, if it is FALSE. Write your answer before the number.

- _____ 1. The student should be wear gloves when working with equipment.
- _____ 2. Never remove protective guards from equipment.
- _____ 3. Always prepared for the unexpected.
- _____ 4. Use the RIGHT TOOL, for the Right Job.
- _____ 5. Do not use pliers as replacement of wrench.

B. Multiple Choice: Choose the best answer. Write your answer before the number.

- _____ 1. It is the tool used for boring the flat surface.
 - A. Pliers
 - B. Hacksaw
 - C. Spirit Level
 - D. Electrical Drill
- _____ 2. It is the lists of tools where they are classified or belong.
 - A. Record Card
 - B. Class Card
 - C. Atm Card
 - D. Menu Card
- _____ 3. It is indicating a trademark where the tools came from or issued.
 - A. Seal
 - B. Bar Code
 - C. Tag
 - D. Brand
- _____ 4. It is the record of all type of tools, materials and equipment.
 - A. Inventory Sheet
 - B. Return Slip
 - C. Purchase Slip
 - D. Card
- _____ 5. The file it should be clean by _____ after using.
 - A. Rugs
 - B. Oil
 - C. Vacuum Cleaner
 - D. Steel Brush



What Do You Need To Know?

Read the Information Sheet 1.1 very well then find out how much you can remember and how much you learned by doing Self-check 1.1.

Information Sheet 1.1

A. Classification of non-functional and functional tools

Tools are very useful to us in our homes especially to our job. But tools that are no longer functional may cause harm.

1. Make an inventory of functional and non-functional tools in your shop.
2. Classify your tools according to its function.

➤ Method of identifying non-functional tools and equipment

1. **Visual inspection.** It refers to the visual observation of an expert on the appearance of the tools and equipment.
2. **Functionality.** Vibration or extra noise from the operation means problems on parts and accessories started to develop.
3. **Performance.** When there is something wrong with the performance of either hand tools or equipment they need an immediate repair or maintenance.
4. **Power supply (for electrically operated only).** Failure to meet the required power supply, malfunction will occur in the part of hand tools or equipment.
5. **Person's involved.** It refers to the technical person who has the knowledge and skills about the technology.

➤ Classifications of tools and equipment according to their uses:

1. Measuring tools
2. Holding tools
3. Cutting tools
4. Driving tools
5. Boring tools
6. Electrical equipment
7. Miscellaneous tools/instrument/equipment

Non-functional tools and equipment are those that are not able to perform their regular function because of impaired and damaged part. Examples of these are the following:



Hammer with a broken handle



Screw driver with a broken handle



Long Nose Pliers with damaged jaw



A broken/cut foot rule



Electrical equipment with damage cord

Functional tools and equipment are those that are in good condition and can perform their regular functions.

CHECKING CONDITION OF TOOLS

Non-functional tools and equipment must be reported in the report card. The following tools and equipment are used in checking the condition of tools.

CLASSIFICATION OF TOOLS AND EQUIPMENT

- Boring tools
- Cutting tools
- Holding tools
- Measuring tools
- Testing tools

Support materials

- Inventory Sheet
- Report Card

BAR CODE LEGEND

Rac BOR.T – 0008 – AUGER BIT

RAC- RAC tool (shop name)

BOR.T- Classification of tools

0008- Code no. in the tool panel

AUGER BIT- Name of tool

**ASSEMBLYWOMAN FELICITA G. BERNARDINO
MEMORIAL TRADE SCHOOL
LIAS, MARILAO, BULACAN**

(Sample Only) RECORD CARD

NAME: _____ **DATE:** _____

YR/SEC: _____ **STUDENT NO:** _____

SHOP TEACHER: _____ **SHOP NAME:** _____

BORING TOOLS

Classification of tools

QUANTITY	UNIT	NAME OF TOOL	CODE	CONDITION	REMARKS

Sample Only

QUANTITY	UNIT	NAME OF TOOL	CODE	CONDITION	REMARKS
2	PCS	AUGER BIT #1	RAC. BOR.T 0001-A. BIT	Broken thread	replaced
3	PCS	Electrical drill #8	RAC. BOR.T 0003-Elect.Drl	Burn motor	replaced

**ASSEMBLY WOMAN FELICITA G. BERNARDINO
MEMORIAL TRADE SCHOOL
LIAS, MARILAO, BULACAN**

RECORD CARD

NAME: _____ **DATE:** _____

YR/SEC: _____ **STUDENT NO:** _____

SHOP TEACHER: _____ **SHOP NAME:** _____

DRIVING TOOLS

Classification of tools

QUANTITY	UNIT	NAME OF TOOL	CODE	CONDITION	REMARKS

Sample Only

QUANTITY	UNIT	NAME OF TOOLS	CODE	CONDITION	REMARKS
1	pc	Claw Hammer # 2	Rac. DRI.T 0002 Claw hammer	Loose Handle	Repaired
1	pc	Screw Driver # 1	Rac.DRI.T 0001 S Driver	Damaged Tip	Repaired

**ASSEMBLYWOMAN FELICITA G. BERNARDINO
MEMORIAL TRADE SCHOOL
LIAS, MARILAO, BULACAN**

RECORD CARD

NAME: _____ **DATE:** _____

YR/SEC: _____ **STUDENT NO:** _____

SHOP TEACHER: _____ **SHOP NAME:** _____

HOLDING TOOLS

Classification of tools

QUANTITY	UNIT	NAME OF TOOL	CODE	CONDITION	REMARKS

Sample Only

QUANTITY	UNIT	NAME OF TOOL	CODE	CONDITION	REMARKS
1	pc	C – Clamp # 4	Rac. Hold.T. 0004 CClmp	Broken Handle	Repaired
1	pc	Pipe Wrench # 3	Rac. Pipe.W 0002 P.Wrnch	Damaged Adjuster	Repaired

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MEMORIAL TRADE SCHOOL
LIAS, MARILAO, BULACAN**

RECORD CARD

NAME: _____ **DATE:** _____

YR/SEC: _____ **STUDENT NO:** _____

SHOP TEACHER: _____ **SHOP NAME:** _____

MEASURING TOOLS

Classification of tools

QUANTITY	UNIT	NAME OF TOOLS	CODE	CONDITION	REMARKS

Sample Only

QUANTITY	UNIT	NAME OF TOOLS	CODE	CONDITION	REMARKS
1	pc	Inside Caliper # 8	Rac. Meas.T 0008 In.Cal.	Loose Legs	Repair
1	pc	Push Pull Rule # 1	Rac. Meas.T 0001 T. Meas	Loose Spring	Repair



How Much Have You Learned?

Self-Check 1.1

Directions: Approach your instructor and request him to check if you have executed the task to his satisfaction. You have 40 minutes to complete this exercise.

Teacher's Checklist		Acceptability	
		YES	NO
1.	Tools were classified correctly		
2.	Demonstrated correct use of tools		
3.	Applied safety measures in holding tools		
4.	Recorded the damage correctly		
5.	Organized the tools properly		

After this activity, proceed to the next page please.

Competent

Not Competent

Student's Name: _____ Date: _____

Teacher's Name: _____ Date: _____



How Do You Apply What You Have Learned?

Show that you learned something by doing this activity

Activity Sheet 1.1

Directions: Conduct an inspection of different tools and equipment in shop room. Name the tools and equipment segregating the functional and non-functional one using the form below.

Item No.	Qty.	Unit	Item to be inspected (Tools)	Condition		Remark for non-functional
				Functional	Non-functional	

Inspected by: _____
Student

Checked by: _____
Shop Teacher

LEARNING OUTCOME 2

Perform basic preventive maintenance

PERFORMANCE STANDARDS

- Appropriate lubricants are identified according to types of equipment.
- Lubricated hand tools are properly stored.
- Inventory of tools, instruments, and equipment are conducted and recorded.
- Defective hand tools, instruments, equipment, and accessories are replaced according to manufacturer's specification
- Proper housekeeping is applied



Materials

- **TUBE BENDER**
- **FLARING BLOCK**
- **SWAGING PUNCH**
- **PIPE WRENCH**
- **PIPE VISE**
- **PIPE CUTTER**
- **TUBE CUTTER**
- **LONG NOSE PLIERS**
- **CUTTING PLIERS**
- **CONBINATION PLIERS**
- **DROP LIGHT**
- **BLOW TORCH**
- **SYSTEM ANALYZER**
- **TIN SHEARS**
- **PORTABLE GRINDER**
- **BENCH VISE**



What Do You Already Know?

Let us determine how much you already know about perform basic preventive maintenance. Take this test.

Pretest LO 2

Directions: Read the question carefully. Choose the letter of the correct answer and write your answers on a separate sheet of paper.

1. It is made from lanolin natural water.
 - A. Kerosene
 - B. Liquid Lubricant
 - C. Water
 - D. Oil

2. It can be lubricant mixed with other based oil
 - A. Water
 - B. Grease
 - C. Kerosine
 - D. Minerals

3. Which is derived from crude oil is a very good quality of lubricant
 - A. Gasoline
 - B. Thinner
 - C. Minerals
 - D. Vegetable Oil

4. Which is primarily triglyceride esters derived from plants and animal?
 - A. Vegetable Oil
 - B. Diesoline
 - C. kerosene
 - D. Water

5. It is the process of prevents corrosion, and to reduce friction
 - A. Scratch
 - B. Sharpen
 - C. Sanding
 - D. Lubricating

6. Is a chart use in scheduling of cleaning the tools, materials and equipment.
- A. Gantt chart
 - B. Flow Chart
 - C. Diagram
 - D. Directory
7. It is used to wash oil / greasy tools and equipment
- A. Kerosene
 - B. Gasoline
 - C. Mineral
 - D. Water
8. It is used to wash oil engine, transmission and other parts of vehicle
- A. Diesoline
 - B. Oil
 - C. Mineral
 - D. Vegetable Oil
9. It is used to remove dust, grease, oil, paint
- A. Soap
 - B. Water
 - C. Kerosene
 - D. Grease
10. It is used to remove spilled paint on the floor, walls and tools
- A. Thinner
 - B. Mineral
 - C. Water
 - D. Vegetable



What Do You Need To Know?

Read the Information Sheet 1.1 very well then find out how much you can remember and how much you learned by doing Self-check 1.1.

Information Sheet 2.1

CLASSIFICATION OF LUBRICANTS

Before using the tools and equipment in the installation of pipes, you have to first know the types of lubricants to use. Lubrication prevents the rusting and malfunctioning of tools and equipment.

There are four types of lubricants, and these are:

1. Liquid, including emulsion and suspension;
 2. Solid;
 3. Grease; and
 4. Paste.
- Liquid lubricants made from lanolin natural water. These lubricants inhibit rust, salt, and acids.
 - Water can also be used as a lubricant mixed with other base oils.
 - Mineral oil which is derived from crude oil is a very good quality of lubricant.
 - Vegetable oil which is primarily triglyceride esters derived from plants and animals can also serve the purpose as a lubricant and is environment friendly.

Purpose for Lubricating

Here are the benefits from lubricating tool and equipment:

- keeps moving parts apart
- reduces friction
- transfers heat more efficiently
- carries away contaminant and debris
- transmits power more efficiently
- protects against wear
- prevents corrosion



How Much Have You Learned?

Self-Check 2.1

Directions: Approach your instructor and request him to check if you have executed the task to his satisfaction.

Teacher's Checklist	Acceptability	
	YES	NO
1. The tools are identified correctly according to the job requirement.		
2. The workplace is kept safe.		
3. Tools are lubricated correctly.		
4. Tools are used and handled properly.		
5. The surrounding is kept clean after lubrication.		

Student's Signature: _____ Date: _____

Teacher's Signature: _____ Date: _____

Competent

Not Competent



How Do You Apply What You Have Learned?

Read the Information Sheet 2.1 very well then find out how much you can remember and how much you learned by doing Self-check 2.1.

Information Sheet 2.1

A. INVENTORY FORM

Sample of how to accomplish inventory tools and equipment

	Unit	Item / Description	Total Number of Tools Receive	Inventory	Total	Remarks
1	PC	Air Compressor	1	1	1	Good Condition
2	PC	Adjustable Wrench 8"	1	0	0	Lost
3	PC	Adjustable Wrench 12"	1	1	1	Good Condition
4	PC	Allen Wrench	1 set	1 set	1 set	Good Condition
5	PCS	Analog Clamp Ammeter	5	5	5	Good Condition
6	PCS	Ball Peen Hammer	3	3	3	Good Condition
7	PC	Bench Vise	1	1	1	Good Condition
8	PC	Chisel	1	1	1	Good Condition
9	PCS	Claw Hammer	1	1	1	Good Condition
10	SET	Combination Wrench	1 Set	1 set	1 set	Good Condition
11	PCS	Combination Pliers	4	3	3	1 Lost
12	PC	De-soldering Pump	1	1	1	Defective
13	PCS	Flaring Tools	10	10	10	10 Defective
14	PCS	Flat Bastard File	4	4	4	Good Condition
15	PCS	Gauge Manifold	3	3	3	Good Condition
16	PC	Grinding Stone	1	1	1	Good Condition
17	PCS	Hack Saw	2	2	2	Good Condition
18	PCS	Long Nose Pliers	4	3	3	1 Lost
19	PC	Map Gas Torch	1	1	1	Good Condition
20	PCS	Multi Tester analog	16	16	16	6 Defective
21	SET	Oxy Acetylene	1 Set	1 set	1 set	Good Condition
22	SET	Pressure Washer (¼ Hp)	1 Set	1 Set	1 Set	Stock-up Motor
23	PCS	Screw Driver (Flat)	23	22	22	1 Lost
24	PC	Screw Driver (Philips)	18	18	18	Good Condition
25	PCS	Side Cutter Pliers	4	2	2	2 Lost
26	PC	Soldering Iron	1	1	1	Good Condition
27	PC	Swaging Tools	10 Sets	10 Sets	10 Sets	Good Condition
28	PCS	Tin snip	4	4	4	Good Condition
29	PCS	Tube Cutter 1/8 – 1 1/8"	10	10	10	4 Defective
30	PC	Vise Grip Wrench	1	1	1	Good Condition
31	PC	Tube Bender	1	1	1	Good Condition
32	PC	Welding Machine	1	1	1	Good Condition

Note: Non-functional tools should to be labeled.

Inspected by: _____ **Checked by:** _____
Student Shop Teacher



How Well Did You Perform?

**Find out by accomplishing the Scoring Rubric honestly and sincerely.
Remember it is your learning at stake!**

ACCURACY (100%)	SCORING CRITERIA
Identified and gave the function of ten hand tools	10
Identified and gave the function of 8-9 hand tools	9
Identified and gave the function of 6-7 hand tools	7
Identified and gave the function of 4-5 hand tools	5
Identified and gave the function of 2-3 hand tools	3
Identified and gave the function of 0-1 hand tools	1



How Do You Apply What You Have Learned?

Show that you learned something by doing this activity

Activity Sheet 2.1

CLASSIFICATIONS OF LUBRICANTS

Directions: Call your teacher and request him to check if you have executed the task based on his satisfaction.

Tool	Grease	Industrial Oil	WD-40
Boring Tools			
Auger bit and brace			
Portable Electric drill			
Cold chisel			
Cutting Tools			
Cross cut saw			

Hack saw			
Pipe cutter			
Pipe reamer			
Pipe thread			
Tube Cutter			
Driving Tools			
Claw hammer			
Crow bar			
Screw driver			
Face Mallet			
Pipe Wrench			
Box Wrench			
Socket Wrench			
Ratchet Wrench			
Holding Tools			
Clamp			
Bench vise			
Adjustable wrench/spanner			
PipeVise			
Measuring Tools			
Multi Tester			
Clamp Meter			
Try square			
System Analyzer			

Tape measure (Pull Push rule)			
Testing Tools			
Plumb bob			
Spirit level			
Try square			

Assemblywoman Felicita G. Bernardino Memorial Trade School

Lias, Marilao, Bulacan

Sample of RECORD CARD

NAME: _____ **DATE:** _____
YR/SEC: _____ **STUDENT NO:** _____
SHOP TEACHER: _____ **NAME OF SHOP:** _____

Maintenance Schedule of Lubrication

Date Time Start Work No.	MAY													
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14
Task														
Lubricate & Clean All Boring Tools														
Lubricate & Clean All Cutting Tools														
Clean All Holding Tools														
Clean All Driving Tools														
Clean All Measuring Tools														
Clean All Testing Tools														

Student's Signature: _____ Date Finished: _____

Teacher's Signature: _____ Date Checked: _____

Competent

Not Competent



Congratulations! You did a great job! Rest and relax a while then move on to the next lesson. Good luck!

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LESSON 5

Perform Housekeeping and Safety



LEARNING OUTCOMES:

At the end of this Lesson, you are expected to do the following:

- LO 1. sort out materials, tools and equipment;
- LO 2. clean workplace area, materials, tools and equipment;
- and
- LO 3. systematize dispensing and retrieval of materials, tools and equipment.



Definition of Terms

Accidental	occurring unexpectedly, unintentionally, or by chance.
Hazards	risks; dangers
Explosive	a substance, especially a prepared chemical, that explodes or causes explosion
Malfunction	to function improperly.
Equipment	device needed for a particular job or activity.
Obstructions	something that block the way
PPE	personal Protective Equipment
Technician	a person skilled in mechanical or industrial techniques or in a particular technical field
Tool kit	a small bag or box equipped with hand tools
Well- equipped	complete with necessary parts/ component.
Lubricant	an oily or greasy substance applied to something in order to reduce friction.
Facilities	a term use for special apparatus that fulfill best function work.
Maintenance	buildings and grounds in good condition and working order. management and upkeep of facilities according to
Housekeeping	workplace procedures and standards.
Maintenance schedule	a list of allocating specific maintenance to a specific period. It is also comprehensive list of maintenance and its incidence.

LEARNING OUTCOME 1

Sort out materials, tools and equipment

PERFORMANCE STANDARDS

- Materials, tools and equipment are classified according to kind.
- Appropriate areas for materials, tools and equipment are designated



Materials

- **PAPER**
- **PENCIL**
- **INVENTORY RECORDS**
- **RUGS**
- **MARKER PEN**
- **SCOTCH TAPE / ADHESIVE TAPE**
- **SCISSORS**
- **CARTOLINA**
- **RESTRAINTS**
- **BED**
- **WHEELCHAIR**
- **PADDING**
- **TRIANGULAR BANDAGE**
- **FIRE EXTINGUISHERS**
- **SPLINTS**



What Do You Already Know?

Let us determine how much you already know about sorting materials, tools, and equipment. Take this test.

Direction: Choose the correct answer. Write your answer in a separate sheet of paper.

PRE-TEST

Directions: Read and understand the questions below. Choose the letter of the correct answer and write it on your answer sheet.

1. What is the best reason for cleaning spills such as grease and water as soon as possible?
A. to avoid accident
B. to make the area clean
C. to eliminate eye sore
D. to impress visitors
2. What is essential part of every job so as not to waste time and effort?
A. good housekeeping
B. good planning
C. good assessing
D. good recording
3. What kind of tools are manipulated by muscle power and skill?
A. hand tools
B. power tools
C. specialized tools
D. swage tools
4. Which of these tools belong to the power tools category?
A. circular saw
B. set of pliers
C. screw driver
D. wrenches
5. What is any unforeseen event that may result to injury?
A. accident
B. incident
C. movement
D. performance
6. What are safety gadgets and devices used by workers/technicians to prevent hazards during work?
A. personal protective equipment
B. personal computer
C. mask
D. none of the above
7. One way of eliminating _____ is to substitute substance with higher toxic levels.

- A. refrigerant
- B. hazard
- C. gas
- D. none of the above

8. What will you do if tools and equipment are in faulty conditions?

- A. use it then complain
- B. drop it, then report defects
- C. secure it, then operate it again
- D. reports it to the supervising person on tools and equipment.

9. What Personal Protective Equipment (PPE) are we going to use if we are constructing a high rise building?

- A. gloves
- B. mask
- C. hard hat
- D. respiratory equipment

10. PPE means _____?

- A. people, place and events
- B. proper protection of eyes
- C. personal protective equipment
- D. personal protective environment



What Do You Need To Know?

Read the Information Sheet 1.1 very well then find out how much you can remember and how much you learned by doing Self-check 1.1.

Information Sheet 1.1

5S (METHODOLOGY)

5S is a reference to a list of five Japanese words translated into English, the letter 5S are actually the first name methodology. This list is a mnemonic for a methodology that is often incorrectly characterized with "standardized cleanup. In fact, it is much more than a cleanup. 5S is a philosophy and a way of organizing and managing the workplace and work flow with the intent to improve efficiency by eliminating wastes, improving flow of production, reducing process delays.

5S is a method of organizing a workplace, especially **shared** workplaces (like a shop floor or an office space, even in school). It is sometimes referred to as a housekeeping methodology, however this characterization can be misleading because organizing a workplace goes beyond housekeeping.

The key targets of 5S are workplace morale and efficiency. The assertion of 5S is, that time must not be wasted. Additionally, it is quickly obvious when something is missing from its designated location. 5S advocates believe the benefits of this methodology come from deciding **what** should be kept, **where** it should be kept, and **how** it should be kept. This decision making process usually comes from a concept of standardization which builds a clear understanding, among employees how work should be done.

In addition, another key distinction between 5S and "standardized cleanup" is Seiton. Seiton is often misunderstood, perhaps due to the efforts of translating into an English beginning with "S" (such as "sort" or "straighten"). The key concept here is to order items or activities in a manner to promote work flow. For example, tools should be kept accessible for use, workers will not find difficulty to access materials, flow paths can be altered to improve efficiency, etc.

The 5S's are:

SEIRI: SORT (CLEAN UP)

This is the step 1 in the 5S program:

"Sorting" means to sort everything in each work area. Keep only what is necessary. Materials, tools, equipment and supplies that are not frequently used should be moved to a separate, specified storage area. Items that are not any more useful should be discarded. Do not keep things around thinking they might be used someday.

Sorting is the first step in making the work area tidy. It makes easier to find the things you need and frees up additional space. In sorting process, you can eliminate (or repair)

broken equipment and tools. Obsolete fixtures, molds, jigs, scrap material, waste and other unused items and materials are disposed.

SEITON: SET IN ORDER (ORGANIZE)

This is the step 2 in the Five S program: Step two is to organize, to arrange to identify everything in a work area for the most efficient and effective retrieval and return of the item to their proper places.

Commonly used tools should be readily available. Storage areas, cabinets and shelves should be properly labeled. Clean and paint floors for you to make it easier to spot dirt, waste materials and spilled parts and tools. Outline areas on the floor to identify work areas, movement lanes, storage areas, finished product areas, etc. Put shadows on tool boards, making it easy to be located.

In an office/school, provide bookshelves for frequently used manuals, books and catalogs. Label the shelves and books so that they can be easily found.

The objective of this step is to put everything in the workplace and properly identified and labeled.

This means that there are two important parts to systematic organization. The first part is putting everything in its proper place and setting up a system so that it is easy to return each item to its proper place. The second part is where good labeling and identification practices are important. Both the equipment/tools and materials you use, as well as their proper storage locations, need to be clearly identified and labeled.

SEISŌ: SWEEP (REGULAR CLEANING)

Step Three: Once you have everything from each individual work area up to your entire facility, sorted (cleaned up) and organized, you need to keep it that way. This requires regular cleaning or to go along with our third S, "shining" things up.

Regular, usually daily, cleaning is needed or everything will be returned to their original places. This can be done by regular inspection. While cleaning its needed also to inspect the machines, tools, equipment and supplies you work with.

Regular cleaning and inspection makes it easy to spot lubricant leaks, equipment misalignment, breakage, missing tools and low levels of supplies.

Problems can be hardly identified and fixed when they are small. If these minor problems that are not addressed they can lead to a serious loss of production. On the other hand, frequent cleaning and inspecting waste time will result to good production.

SEIKETSU: STANDARDIZE (SIMPLIFY)

Step Four: To ensure that the first three steps in your Five S program are done effectively, the fourth step is to simplify and to standardize actions

The good practices developed in steps 1 through 3 should be standardized and made easy to accomplish. Develop a work structure that will support the new practices and make them into habits. As you learn more, update and modify the standards to make the process simpler and easier. One of the hardest steps is **avoiding old work habits**. It is easy to slip

back into what you have been doing for years. It gives comfort most of the time for this is part of your habit. Use standards to help people work into new habits that are a part of your Five S program.

Any easy way of making people to be aware of, and reminded of the standards is to use labels, signs, posters and banners in the workplace.

SHITSUKE: SUSTAIN

Step Five: The final step is to continue training and maintaining the standards. Have a **formal system for monitoring the results** of your Five S program. Do not expect that you can clean up, get things organized and labeled, and ask people to clean and inspect their areas every day -- and then have everything continue to happen without any follow-up.

Continue to educate people about maintaining standards. When there are changes - such as new equipment, new products, new work rules - that will affect your Five S program, and adjustments to accommodate those changes. Make any needed changes in the standards and provide training that addresses those changes.

Translations and modifications

Often in the west, alternative terms are used for the five S. These are "Sort, Straighten, Shine, Systemize and Sustain". "Standardize" is also used as an alternative for "Systemize". Sometimes "Safety" is included as 6th S. Similarly 5Cs aim at same goal but without the strength of maintaining the 5S name.

Clear out and classify

- Clearing items no longer required
- Tagging items that may be required and storing away from workplace

Configure

- A specific place for specific items
- A place for everything and everything in its place"

Clean and check

- Identify the cleaning zones and establishing cleaning routines

Conformity

Custom and practice

- Monitoring process adherence
- Continually validating process
- Customer satisfaction by doing scientific training to workers

- Continually focus on man, machine, material & method

Alternative acronyms have also been introduced, such as **CANDO** (Cleanup, Arranging, Neatness, Discipline, and Ongoing improvement). Even though he refers to the ensemble practice as "5S" in his canonical work

Hirano prefers the terms Organization, Orderliness, Cleanliness, Standardized Cleanup, and Discipline because they are better translations than the alliterative approximations. In the book, there is a photo of a Japanese sign that shows the Latin "5S" mixed with Kanji.

Practice Good Housekeeping

Good housekeeping is one of the surest ways to identify a safe workplace. You can tell how workers feel about safety just by looking at their housekeeping practices. Good housekeeping is not the result of cleaning up once a week or even once a day. It is the result of keeping cleaned-up all the time. It is an essential factor in a good safety program, promoting safety, health, production, and morale.

Whose responsibility is housekeeping? It is everyone's. Clean work areas and aisles help eliminate tripping hazards. Respecting "wet floor" signs and immediately cleaning up spills prevents slipping injuries. Keeping storage areas uncluttered reduces the chances of disease and fire as well as slips, trips, and falls. Accumulated debris can cause fires and clutter slows movement of personnel and equipment during fires.

Other housekeeping practices include keeping tools and equipment clean and in good shape or keeping hoses and cables or wires bundled when not in use. Broken glass should be picked up immediately with a broom and dustpan, and never with bare hands. Be aware of open cabinet drawers,

Electric wires, sharp corners or protruding nails. Either to correct the unsafe condition if you are able to do so, or to notify the person responsible for overall maintenance should be done.

How a workplace looks makes an impression on employees and visitors alike. A visitor's first impression of a business is important because that image affects the amount of business it does. Good housekeeping goes hand-in-hand with good public relations. It projects order, care, and pride.

Besides preventing accidents and injuries, good housekeeping saves space, time, and materials. When a workplace is clean, orderly, and free of obstruction; work can get done safely and properly. Workers feel better, think better, do better work, and increase the quantity and quality of their work.



How Much Have You Learned?

Self-Check 1.1

DIRECTIONS: Student will visit the tool panel, then record, arrange the tool panel according to its classification. Write your answer on another sheet of paper.

	Item / Description	Classification of Tools and Equipment		Item / Description	Classification of Tools and Equipment
1	Center punch		24	Oxy Acetylene	
2	Adjustable Wrench		25	Chisel	
3	Open Wrench		26	Electric Drill	
4	Allen Wrench		27	Wire Gauge	
5	Electronic Leak Detector		28	Side Cutter Pliers	
6	Ball Peen Hammer		29	Pinch Off Pliers	
7	Soft face Hammer		30	Swaging Tools	
8	Chisel		31	Copper Tubing	
9	Claw Hammer		32	Tube Cutter	
10	Combination Wrench		33	Vise Grip Wrench	
11	Combination Pliers		34	Tube Bender	
12	Vacuum Pump		35	Welding Machine	
13	Flaring Tools		36	Clamp Ammeter	
14	Flat Bastard File		37	Box Wrench	
15	Gauge Manifold		38	Aluminum Tubing	
16	Recovery and Recycling Machine		39	Hack Saw	
17	Hack Saw		40	Socket Wrench	
18	Long Nose Pliers		41	Rods	
19	Sledge Hammer		42	Pipe Wrench	
20	Multi Tester		43	Hard Drawn Copper Tubing	
21	Filter Drier		44	Capillary Tube	
22	Thermostat		45	Flux	
23	Relay		46	Silver Rod	

PREPARED BY:

PRINTED NAME OVER SIGNATURE

CHECKED BY:

TEACHER IN SHOP

PERFORMANCE CRITERIA

PERFORMANCE LEVEL

	YES	NO	NA
1. Were the tools and equipment ready before performing the task?			
2. Were the tools arranged according to their types?			
3. Were the equipment placed in their proper location and arranged according to their types?			
4. Were the tools/equipment placed in their respective location and accessible for use when needed?			
Overall Performance	<input type="radio"/> Satisfactory <input type="radio"/> Unsatisfactory		
Student's name: _____ Year and Sections: _____			
Teacher's Name: _____ Comment / Suggestion: _____ _____ _____			



How Do You Apply What You Have Learned?

Show that you learned something by doing this activity.

Operation Sheet 1.1

PROCEDURE IN ARRANGING AND STORING TOOLS AND EQUIPMENT

Directions: In a particular tool cabinet and a tool rack assigned to you, you will arrange and store tools and equipment accordingly.

Procedure:

1. Classify the tools and equipment according to their types.
2. Arrange the tools by their types in the shelves/racks.
3. Place equipment in designated places or location.

PERFORMANCE CRITERIA	PERFORMANCE LEVEL		
	YES	NO	NA
1. Were the tools and equipment ready before performing the task?			
2. Were the tools arranged according to their types?			
3. Were the equipment placed in their proper location and arranged according to their types?			
4. Were the tools/equipment placed in their respective location and accessible for use when needed?			
Overall Performance	<input type="radio"/> Satisfactory <input type="radio"/> Unsatisfactory		
Student's name: _____ Year and Sections: _____			
Teacher's Name: _____ Comment / Suggestion: _____ _____			

PROCEDURE IN MAKING AND POSTING VISIBLE LABELS

Directions: Given a cartolina, pair of scissors and glue, you will make and post visible corresponding labels on the tools and equipment using a computer.

Procedure:

1. Prepare necessary tools, supplies and materials.
2. Determine the number of tools and equipment to be labeled in accordance with each type.
3. In the computer, type the name of the tools using Arial font style and a font size of 60.
4. Print the document in the cartolina.
5. Cut the cartolina with a dimension of 1" x 8".
6. Post corresponding labels on the tools and equipment.
7. Review your work to check the accuracy of the labels posted.

PERFORMANCE CRITERIA	PERFORMANCE LEVEL		
	YES	NO	NA
1. Was the spelling of tools correct?			
2. Were the labels properly posted on the respective tools/equipment?			
3. Were the labels visible at a distance of at least 10 meters?			
4. Was the specified font style and size used?			
Overall Performance	<input type="radio"/> Satisfactory <input type="radio"/> Unsatisfactory		
Student's name: _____ Year and section: _____			
Teacher's Name:			
Comment / Suggestion:			



What Do You Need To Know?

Read the Information Sheet 1.2 very well then find out how much you can remember and how much you learned by doing Self-check 1.2.

Information Sheet 1.2

PREVENTIVE MEASURES FROM EXPOSURE TO WORKPLACE ACCIDENT

Areas Where Hazards Can Be Controlled



Generalized Diagram of Control Method

SOURCE

RECEIVER

1. Substitution with a less harmful material (water in place of organic solvent)
2. Change of process (airless paint spraying)
3. Enclosure of process (glove - box)
4. Isolation of process (space or time)
5. Wet methods (hydro blast)
6. Local exhaust ventilation (capture at source)
7. Adequate maintenance program

1. Housekeeping (immediate cleanup)
2. General exhaust ventilation (roof fans)
3. Dilution ventilation (supplied air)
4. Increase distance between source and receiver (semi -automatic or remote control)
5. Continuous area monitoring (pre -set alarms)
6. Adequate maintenance program

1. Training and education (most important)
2. Rotation of workers (split up dose)
3. Enclosure of worker (air conditioned crane cabs)
4. Personal monitoring devices (dosimeters)
5. Personal protective devices (respirators)
6. Adequate maintenance program

THE PREVENTIVE MEASURES

Engineering – changes to the process or equipment that reduce or eliminate exposure to an agent or hazard.

Administrative – changes in how a worker accomplishes the necessary job tasks.

Personal Protective Equipment – Consists of devices provided to the worker and required to be worn while performing certain job tasks.

INDUSTRIAL VENTILATION

The process of supplying or removing air by natural or mechanical means to and from any space.

PURPOSE:

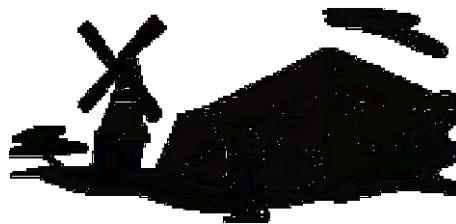
- To ensure condition of thermal comfort.
- To renew the air in the workplace, therefore diluting eventual air contaminants to acceptable levels.
- To prevent hazardous air contaminants from reaching the workers breathing zone.

GENERAL VENTILATION

It aims the removal of air in the work environments so that the possible contaminants are diluted to levels considered to be not harmful to health and/ or to provide workers comfort cooling.

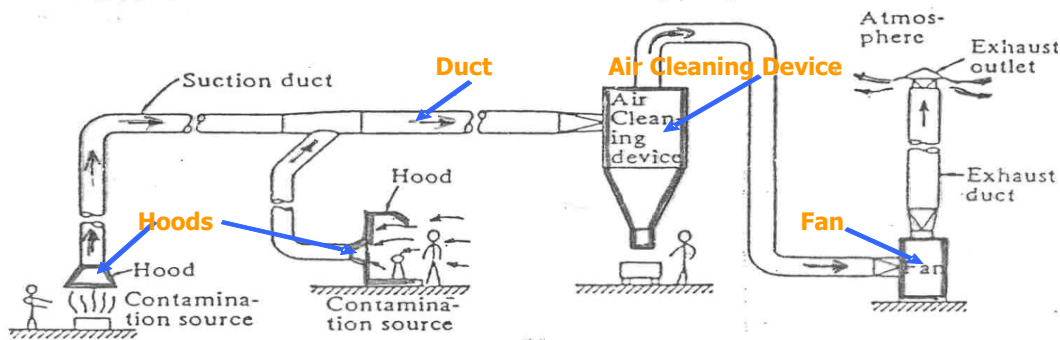
MEANS

- Natural
- Exhaust Fans
- Local Cooling
- Air-condition



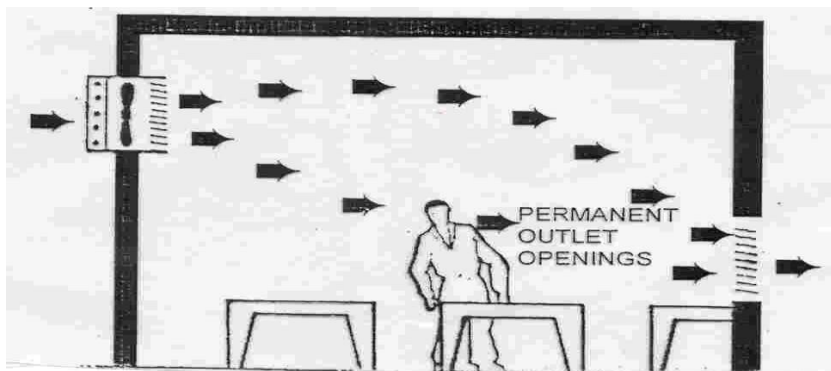
LOCAL EXHAUST VENTILATION (LEV)

It aims at the removal of the air contaminants from the working environment before they can reach the breathing zone of the workers in harmful concentration.



Basic Elements

GENERAL OR DILUTION VENTILATION



Mechanical Ventilation

EXAMPLES OF LOCAL EXHAUST HOODS



TABLE OF RANGE OF CONTROL VELOCITIES

Range of Control Velocities:

Condition of Dispersion of Contaminant	Examples	Control Velocity, m/sec
Released with practically no velocity into quiet air	Evaporation from tanks	0.25 – 0.50
Released at low velocity into moderately still air	Spray booth, plating, welding	0.50 – 1.0
Active generation into zone of rapid air motion	Barrel filling, crushers	1.0 – 2.5
Released of high initial velocity into zone of rapid air motion	Grinding, abrasive blasting	2.5 – 10.0



How Much Have You Learned?

Self-Check 1.2

Directions: Answer the question below. Write your answer on another sheet of paper

Short-Answer Questions

1. Discuss the importance of personal protective equipment.

2. Discuss how to manage chemical hazards.

3. Describe how to use the personal protective equipment.

Refer to the Answer Key. What is your score?



How Well Did You Perform?

**Find out by accomplishing the Scoring Rubric honestly and sincerely.
Remember it is your learning at stake!**

Records of Achievement

Controls hazards and risks	Completed	
	YES	NO
Performance criteria: <ol style="list-style-type: none"> 1. Occupational Health and Safety (OHS) procedures for controlling hazards/risks in the workplace are consistently followed. 2. Procedures for dealing with workplace accidents, fire and emergencies are followed in accordance with organization OHS policies. 3. Personal protective equipment (PPE) is correctly used in accordance with organization OHS procedures and practices. 4. Appropriate assistance is provided in the event of a workplace emergency in accordance with established organization protocol. 		
Results	Competent	Not yet competent
Comments: <hr/> <hr/> <hr/> <hr/>		
Learner has satisfied the above performance criteria: Learner's signature : _____ Trainer's signature : _____ Date : _____		



What Do You Need To Know?

Read the Information Sheet 1.1 very well then find out how much you can remember and how much you learned by doing Self-check 1.1.

Information Sheet 1.3

FIRST AID

The immediate care given to a person who has been injured or suddenly taken ill. It includes self-care and home care if medical assistance is not available or delayed.

RULES OF FIRST AID

- Bridge the gap between the victim and physician.
- Not intended to compete or takes place the service or the physician.
- Ends when the service of the physician begins.

OBJECTIVES OF FIRST AID

- Prolong life
- Alleviate suffering
- Prevent further injury

GUIDELINE IN GIVING FIRST AID

GETTING STARTED

- Planning
- Gathering
- Initial Response
 - A – Ask for help
 - I – Intervene
 - D – Do not further harm
- Instruct Helper

EMERGENCY ACTION PRINCIPLE

- Survey the Scene
- Assess
 - A – Airway
 - B – Breathing
 - C – Circulation

- Arrange Transport Facility

HINDRANCES IN GIVING EMERGENCY CARE/ FIRST AID

- Unfavorable Surroundings
- Presence of crowd
- Pressure from victim or relative

CHARACTERISTICS OF A GOOD FIRST AID PROVIDER

- Gentle
- Observant
- Resourceful
- Tactful
- Sympathetic

AIRWAY OBSTRUCTION (CHOKING)

What to do...

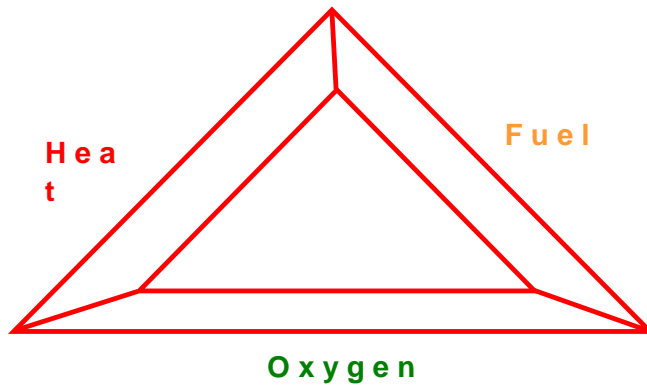
- Assess the victim
- Perform Heimlich maneuver/ abdominal thrust.
- Chest thrust
- Back tap
- CPR (if necessary)

Rules when Lifting

- Correct Feet Position
- Firm hold with Palm
- Straight Flat Back
- Head Raise, Chin In
- Lift with Legs
- Use Body Weight

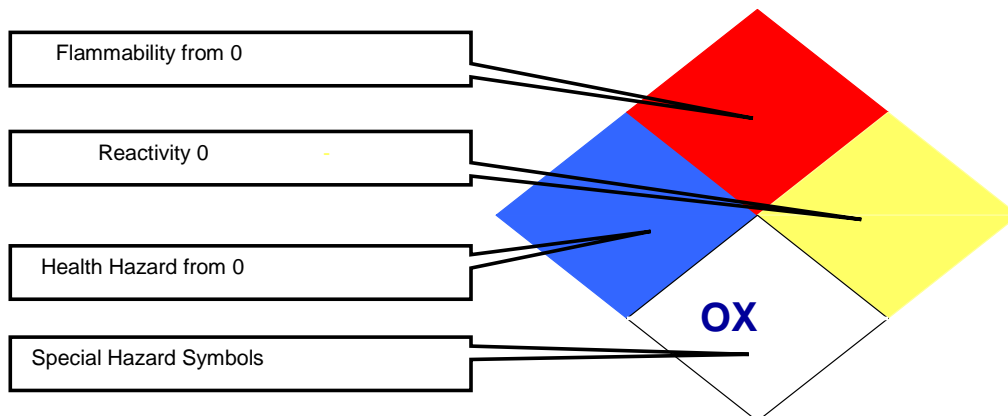
FIRE PREVENTION & CONTROL

FIRE TRIANGLE



HAZARD COMMUNICATION

NFPA Diamond



PROTECTION AGAINST FIRE

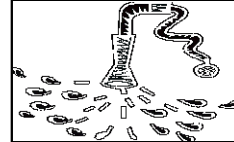
❖ Structure Precautions

- Fire-resistant structural elements
- Walls, doors & openings should contain fire
- Non – flammable roofs and walls
- 30 minutes fire resistance and automatically closing doors
- Cavities & voids be separated by fire-resistant partition
- Insulated electrical cables
- Fire-resistant walls to separate compartments
- Control smoke by using ventilators



❖ FIRE DETECTORS AND ALARMS

❖ SPRINKLER SYSTEMS



HOW TO PREVENT FIRES

- **OBSERVE SMOKING RULES** and remind others to do the same.
- **INSPECT YOUR AREA** and equipment frequently.
- **REPORT** unsafe condition.
- **OBSERVE** proper housekeeping.
- **AVOID PILING UP TRASH** and other flammable.
- **KEEP** fire exits clear.
- **USE EXTRA CAUTION** around gas, flammable, and oxygen equipment.

KNOW WHAT TO DO IN CASE OF FIRE

DON'T PANIC!

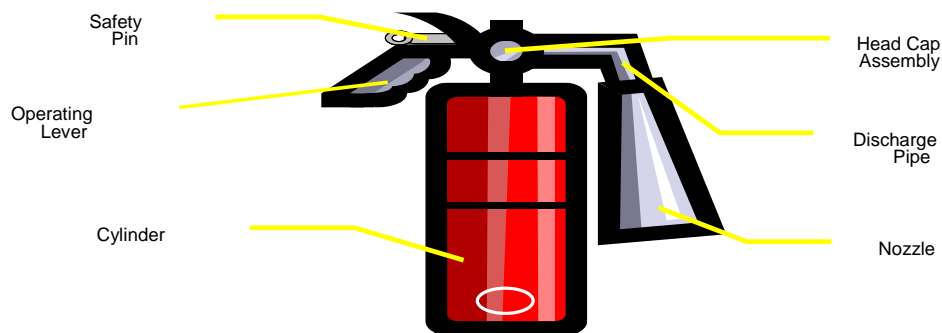
KNOW

- ... your evacuation plan.
- ... your fire station.
- ... where alarm boxes are located.
- ... where extinguishers are located.

FIRE ESCAPE PLANNING

- Practice Escaping From Every Room
- Have two ways to get out of each room.
- Make sure that
 - ✓ Windows are not stuck
 - ✓ Screens can be taken out quickly
 - ✓ Security bars can be properly opened
- Security Bars Require Special Precautions
 - ✓ Must have quick release devices allow them to be opened immediately in an emergency.
- Get Out and Stay Out
 - ✓ Remember to escape first.
 - ✓ Never go back into a burning building for any reason.
 - ✓ Tell the fire fighters if someone is missing.
- Designated A Meeting Place Outside and Take Attendance

MAJOR PARTS OF A FIRE EXTINGUISHER



P A S S

- **P**ull the pin.
- **A**im at the base of the fire.
- **S**queeze the lever.
- **S**wing the nozzle from side to side.



- It is best to have yearly training.
- Remember, a Fire Extinguisher can be used for small fire only.



How Much Have You Learned?

Self-Check 1.3

Short-Answer Questions

1. Describe how to use the fire extinguisher.

2. Define what first aid is.

3. Give the types of open wounds.

4. The first aid for open wounds.

Refer to the Answer Key. What is your score?

Records of Achievement

Maintain OHS Awareness	Completed	
	YES	NO
<p>Performance criteria:</p> <ol style="list-style-type: none"> 1. Emergency-related drills and trainings are participated in as per established organization guidelines and procedures. 2. OHS personal records are completed and updated in accordance with workplace requirements. 		
Results	Competent	Not yet competent
<p>Comments :</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>		
<p>Learner has satisfied the above performance criteria:</p> <p>Learner's signature : _____</p> <p>Trainer's signature : _____</p> <p>Date : _____</p>		

Demonstration [continued]

QUESTIONS	Satisfactory response	
	Yes	No
The candidate should answer the following questions:		
1. Discuss electrical safety precautions.		
2. Describe a safety working environment.		
3. Describe how to use the fire extinguisher.		
4. Give the types of open wounds.		
The candidate' underpinning knowledge was:		
Satisfactory <input type="checkbox"/> Not satisfactory <input type="checkbox"/>		
Feedback to candidate:		
The candidate's overall performance was:		
Satisfactory <input type="checkbox"/> Not satisfactory <input type="checkbox"/>		
Candidate signature:	Date:	
Assessor signature :	Date:	

QUESTIONING/INTERVIEW

Candidate's name:					
Unit of competency:		Occupational health and safety procedure			
Competency standards		Aquaculture NC II			
Oral/interview questions			Satisfactory response		
			Yes		No
1. What would you do to treat an open wound?, 2. what do you think would happen if open wound are not treated properly? 3. What safety equipment and clothing should you use when working in the field?					
The candidate's underpinning knowledge was:					
Satisfactory <input type="checkbox"/>			Not satisfactory <input type="checkbox"/>		
Assessor's Signature				Date	
Feedback to candidate:					
Acceptable answers are:					
1. [insert suggested answer to questions]					
2.					
3.					
Assessor signature:				Date:	

QUESTIONING/INTERVIEW

Candidate's name:			
Unit of competency:		Occupational health and safety procedure	
Competency standards		Aquaculture NC II	
Oral/interview questions		Satisfactory response	
		Yes	No
What would you do to avoid hazard and risk in the area?			
What would you do in the event when chemicals applied in the pond is not safe?			
What safety equipment should you use when application of pesticides?			
What would you do to prevent hazard in cleaning of tools and equipments?			
The candidate's underpinning knowledge was:			
Satisfactory <input type="checkbox"/>		Not satisfactory <input type="checkbox"/>	
Assessor's Signature		Date	
Feedback to candidate:			
Acceptable answers are:			
1. [insert suggested answer to questions]			
2.			
3.			
Assessor signature:		Date:	
The candidate's overall performance was:			
Satisfactory <input type="checkbox"/>		Not Satisfactory <input type="checkbox"/>	

LEARNING OUTCOME 2

Clean workplace area, materials, tools and equipment

PERFORMANCE STANDARDS

- Cleaning materials are identified according to specified application and procedures
- Workplace area, tools, materials, and equipment are cleaned using specified cleaning materials.
- Workplace is in safe condition in accordance with safety regulation practices.



Materials

- RUGS
- SOAP
- WORKING CLOTH
- MOP
- PALE
- DIPPER
- BROOM
- FLOOR WAX
- COCONUT HUSK



What Do You Already Know?

Let us determine how much you already know about the cleaning workplace area, materials, tools and equipment. Take this test.

Pretest LO 2

Directions: Read the questions carefully. Choose the letter of the best answer and write your answer on a separate sheet of paper.

1. What type of facility should be arranged in an orderly position?
a. books and notebooks c. pipes and lumbers
b. chairs and tables d. papers and pencil
2. What is the place where information of job requirements is given?
a. classroom c. play yard
b. shop room d. workplace
3. When there is a fire, it provides safe access for persons to get out of a building.
a. extra fire c. fire routine
b. multiple route d. fire exit
4. What material is used for lubricating tools for proper functioning?
a. water c. mechanical oil
b. cream d. sand paper
5. What is an unforeseen event that may result to injury?
a. accident c. hazard
b. incident d. related event

B. TRUE OR FALSE

Directions: Write letter T, if the statement is true, and Letter F, when it is False.

- _____ 1. Always check the tools/instrument and equipment before using.
- _____ 2. Use the appropriate materials, tools, instrument and equipment as per job or task requirement.
- _____ 3. Always wear personal protective equipment like gloves, goggles, hard hat etc., at all times.
- _____ 4. Wait for the final instruction before doing the job or task.
- _____ 5. Report to the person in authority whenever untoward incident happens



What Do You Need To Know?

Read the Information Sheet 2.1 very well then find out how much you can remember and how much you learned by doing Self-check 2.1.

Information Sheet 2.1

THINKS TO REMEMBER

Accident are any unforeseen event that may lead to injury.

Hazard are any situation that may result danger or threat.

Work Area Housekeeping

Good housekeeping is an essential part of every job. Work area, aisles, walkways, and equipment shall be kept clear of loose materials, tools, and scraps.

Materials such as pipes, lumbers must be stored in an orderly and secure manner. Spills such as grease, water or oil shall be cleaned as soon as possible. A delay could result in an accident to you or fellow student.

A safe access shall be maintained to work areas. Short cut should be avoided. Never block aisles, traffic lanes or traffic exits with equipment or materials.

Work place that has a bench, work areas and a tool room must always be free from dust and material hazards. Tools, Equipment, and materials must be kept in a tool room for safe keeping and proper issuance and retrieval.

Tools must be kept in order. They must be classified and kept inside a tool room according to their classification such as cutting tools, driving tools and measuring tools. Tools as time go on wears and so it is just proper to subject all tools and equipment to preventive maintenance. Basic hand tools need to be lubricated to prevent rusting and lessen the effectiveness of the tools.

The ultimate goal of good housekeeping is to minimize if not to eliminate accident in workplace. An accident is any unforeseen or unexpected event that may or may not result in injury or damage to property or equipment.

The ultimate goal in accident prevention is “zero” disabling injuries and no lost work time. However there are many barriers in achieving this goal. The most important of which is the human attitude. Most important of which is the human attitude. Most people feel that “it won’t happen to me or couldn’t happen here” You could do more to protect yourself and your classmates by constantly thinking and practicing accident prevention. Memorize all the safety rules, regulations ever written or invented. You must THINK before you act.

PREVENTIVE MAINTENANCE TASKS

The following tasks should be performed at least every three months:

1. Clean the exterior and the interior of the equipment cabinet, using a vacuum cleaner and/or a clean cloth.
2. On larger systems clean air filter using a vacuum cleaner to remove accumulated dust or dirt.
3. Visually inspect all wiring and cables for cuts, fraying, deterioration, kinks, strains and mechanical holders. Tape, solder or replace any defective wiring or hooded connectors.
4. Inspect all mechanical security: key switches, indicating lamps, control knobs, fans and data entry keyboards. Tighten or replace as required.
5. Inspect all modules mounted in panels on I/O slots to insure that each module is securely seated in its connector. Remove and clean any module which may have collected excess dust or dirt.



How Much Have You Learned?

Self-Check 2.1

Directions: Read the questions carefully. Choose the letter of the best answer and write your answer on a separate sheet of paper.

1. Why do we have to preserved evidence when accidents occur?
 - A. have safe records
 - B. support our claim
 - C. evade punishment
 - D. none of the above
2. What is the administering first hand cure/treatment when accidents happen?
 - A. first of may
 - B. first come
 - C. first serve
 - D. first aid
3. In administering first aid on _____, we apply cloth pad soaked in cold water to ease the pain .of the bruised part.
 - A. bruises
 - B. sprains
 - C. burns
 - D. none of the above
4. Identify one type of accident occurrence at work.
 - A. eating foodstuff
 - B. talking to friends
 - C. hearing music
 - D. carrying objects
5. Which one is not a good formula in recording accidents?
 - A. record about the incident
 - B. pressure evidence
 - C. obtain a report/blower
 - D. none of the above
6. To improve safety in the workplace, one provision is to set up/install _____ in all building entrance.
 - A. parking
 - B. check point
 - C. close circuit television (cctv)
 - D. none of the above
7. Natural _____ separate workers from the visitors-customers.
 - A. barriers
 - B. counter
 - C. entrance

D. none of the above

8. This area can serve as a retreat in case of attrition or other danger.

- A. work area
- B. secure area
- C. dining area
- D. play area

9. Desks, countertops and partitions in work place are called _____.

- A. work area
- B. barriers
- C. alarm system
- D. communication system

10. Always keep important papers, tools and instrument locked in a _____ cabinet.

- A. secure
- B. open
- C. close
- D. none of the above

Refer to the Answer Key. What is your score?



How Do You Apply What You Have Learned?

Show that you learned something by doing this activity.

Operation Sheet 2.1

Procedure in Cleaning Tools and Work Area

Directions: Bring cleaning solvents, rags, brooms, air compressor, washing pan and safety apparel. Clean tools and work area and observe Occupational Health and Safety practices.

Procedure:

A. Tools

1. Wear protective clothing and goggles.
2. Gather the tools to be cleaned in the designated area for cleaning.
3. Classify the tools to be cleaned according to how dirty they are.
4. Measure and pour enough amount of cleaning solvent to the washing pan.
5. Submerge the tools in the washing pan.
6. Use paint brush to remove the dirt from the tools.
7. Get the tools from the washing pan and wipe them with rags until dry.
8. Clean and keep all materials used for cleaning.

B. Work Area

1. Wear protective clothing and goggles.
2. If there is dirt on the floor such as paint, used oil, grease, rust, etc., remove it first using the appropriate cleaning solvent.
2. Use the air compressor to dry the floor and the broom in cleaning the remaining dirt in the work area.



How Well Did You Perform?

Find out by accomplishing the Scoring Rubric honestly and sincerely.
Remember it is your learning at stake!

PERFORMANCE CRITERIA	PERFORMANCE LEVEL		
	YES	NO	NA
1. Were protective clothing and goggles worn at all times?			
2. Were tools and equipment free of dust, grease, oil and other substances?			
3. Was the work area dry, free of dust, grease and other substances?			
4. Were excess cleaning substances cleaned and kept in proper places?			
Overall Performance	<input type="radio"/> Satisfactory <input type="radio"/> Unsatisfactory		
Student's name: _____ Year and Section: _____			
Teacher's Name: _____			
Comment / Suggestion: _____ _____ _____ _____			



Congratulations! You did a great job! Rest and relax a while then move on to the next lesson. Good luck!

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LEARNING OUTCOME 3

SYSTEMATIZE DISPENSING AND RETRIEVAL OF MATERIALS, TOOLS, AND EQUIPMENT

PERFORMANCE STANDARDS

- System for requesting, borrowing and returning of materials, tools, and equipment is followed and implemented.
- Form used is completely filled-up and filed.
- Borrowed tools and equipment are returned to designated area.
- Materials are consumed as requested.



Materials

- **BARROWER SLIP**
- **PAPER AND PENCIL**
- **ERASER OR CORRECTION LIQUID**
- **FLOW CHART**



What Do You Already Know?

Let us determine how much you already know about systematize dispensing and retrieval of materials, tools and equipment. Take this test.

Pretest LO 3

Directions: Write letter T if the statement is true, and letter F, if it is false

- _____ 1. Use the right tools or equipment for the job and use them properly.
- _____ 2. Keep all tools sharp, clean, and in safe working order.
- _____ 3. Retain all tool guards and safety devices.
- _____ 4. Read instructions on how to operate the machine safely in all working conditions.
- _____ 5. Make sure that all guards and barrels are in place. Adjust properly before using a machine tool.
- _____ 6. Use correct fitting wrenches to remove dirt from nut and bolt.
- _____ 7. Keep work areas clean and free from other hazards.
- _____ 8. Store tools/materials and supplies safely in cabinets.
- _____ 9. Clean chips from a machine with brush not with rag or bare hands.
- _____ 10. Wear eye protection when using grinders and buffers.



What Do You Need To Know?

Read the Information Sheet 3.1 very well then find out how much you can remember and how much you learned by doing Self-check 3.1.

Information Sheet 3.1

This lesson deals with the effective management of school property particularly relating to tools, materials and equipment and its systematic flow from dispensing to retrieval

Proper Storage of Tools and Equipment

1. Clean the cabinet or tool room.
2. Classify the functional and the non functional tools.
3. Non-functional tools are segregated and labeled.
4. Clean tools and equipment.
5. Store idle tools when not in use.
6. Tools should be stored in a dry and safe place.
7. Keep tools and equipment clean, with oil and unplug from power source.

Maintenance and Safety Storage of Tools and Equipment

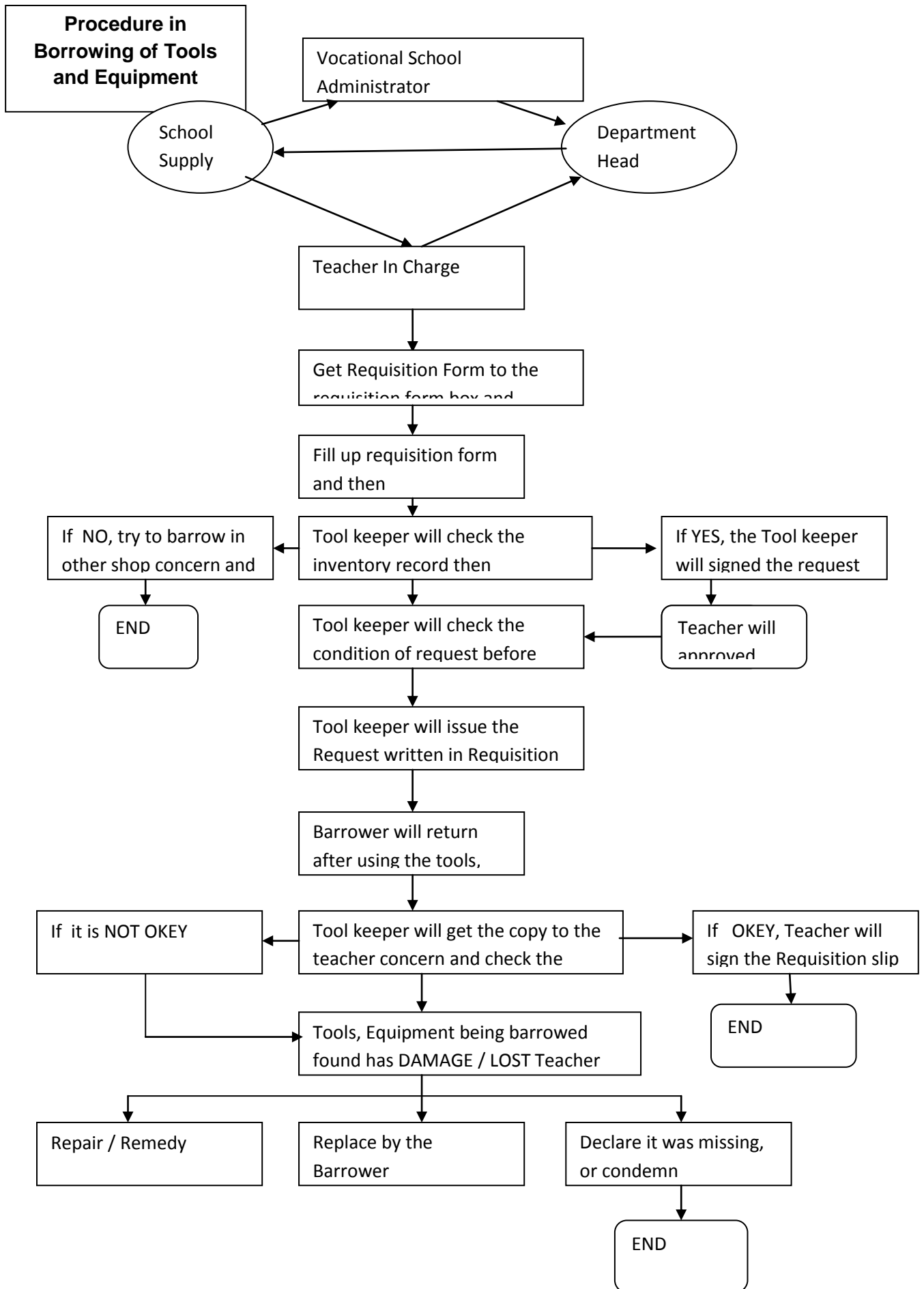
1. Use the right tools or equipment for the job and use them properly.
2. Keep all tools sharp, clean, and in safe working order.
3. Retain all tool guards and safety devices.
4. Read instructions on how to operate the machine safely in all working conditions.
5. Make sure that all guards and barrels are in place. Adjust properly before using a machine tool.
6. Use correct fitting wrenches to remove dirt from nut and bolt.
7. Keep work areas clean and free from other hazards.
8. Store tools/materials and supplies safely in cabinets.
9. Clean chips from a machine with brush not with rag or bare hands.
10. Wear eye protection when using grinders and buffers.

Forms for Tools and Equipment Management

1. Inventory and inspection report of unserviceable property is used to list the school properties including the tools and equipment which are not serviceable.
2. Waste material report includes the materials present in the school which are disposable.
3. Maintenance schedule report indicates the schedule of checking of tools and equipment.

LET US REMEMBER

Effective transfer of technology requires a hands-on experience and the actual encounter with technology can best be done in the presence of tools and equipment. Therefore such tools need perfect care and maintenance.





How Much Have You Learned?

Self-Check 3.1

Short-Answer Questions

1. Describe a safety working environment.

2. Discuss electrical safety precautions.

3. Discuss chemical safety precautions.



How Well Did You Perform?

**Find out by accomplishing the Scoring Rubric honestly and sincerely.
Remember it is your learning at stake!**

PERFORMANCE CRITERIA	PERFORMANCE LEVEL		
	YES	NO	NA
1. Were protective clothing and goggles worn at all times?			
2. Were tools and equipment free of dust, grease, oil and other substances?			
3. Was the work area dry, free of dust, grease and other substances?			
4. Were excess cleaning substances cleaned and kept in proper places?			
5. Were the question answer correctly?			
6. Were the activity being perform orderly?			
Overall Performance	<input type="radio"/> Satisfactory <input type="radio"/> Unsatisfactory		
Student's name: _____ Year and Section: _____			
Teacher's Name: _____			
Comment / Suggestion: _____ _____ _____ _____			

RUBRICS

10 points- if 5 types of hazards were identified

8 points- if 4 types of hazards were given

6 points- if 3 types of hazards were given

4 points -if 2 types of hazards were given

2 points- if 1 types of hazards were given

0 point- if student cannot identify/give types of hazard.



Congratulations! You did a great job! Rest and relax a while then move on to the next lesson. Good luck!

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- Althouse, Turnquist, and Bracciano. **Modern Refrigeration and Air Conditioning 18th Edition**. Illinois: The Goodheart - Willcox Company Incorporated. ©2004.
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ANSWER KEYS:

LO1. Identify Tools and Materials

Pre-Test

- | | |
|-----|---------------------------|
| 1. | B- Clean and dry |
| 2. | A- flaring block |
| 3. | D- swaging |
| 4. | B- Oxyacetylene |
| 5. | D-Stub |
| 6. | B-Box Wrench |
| 7. | B- Stainless steel Tubing |
| 8. | A- Copper tube |
| 9. | B- Flaring Tool |
| 10. | C-Welding |

Self-Check 1.1

I. Multiple Choice

1. A – Copper Tube
2. D – Adjustable Wrench
3. B- Flaring Block
4. C- Flaring Tools
5. D- Stainless Steel Tube
6. A- Clean and Dry
7. C- Oxy acetylene
8. A- Tube Cutter
9. C- Soldering
10. D- Swaging

II. Identification

A

1. Coupling Straight Male 45° Flare Screw on type reusable
2. Coupling straight male Push on Barb type usable with 90°
3. Push on barb type reusable with o-ring seal
4. Permanent crimped on non-reusable
5. Coupling straight male 45° flare push on type

B

1. Union Coupling
2. Flare Nut
3. Flare Tee Fittings
4. Flare 90° Elbow
5. Flare Nut

C

1. Elbow 90°
2. Tee
3. Adaptor
4. Coupling with rolled stop

IV. Matching Type

1. G – Philip Screw
2. H – Long Nose
3. E- Swage
4. J- Pipe Wrench
5. A- Claw Hammer
6. I- Vise Grip
7. C- Tube Cutter
8. D- Flare Yoke
9. B- Adjustable Wrench
10. F- Mechanical Bender

LO2 Request Materials and Tools

Pre-Test

1. **D- Name of Project**
2. **A- Balance on Hand**
3. **D- Requisition Quality and Unit**
4. **A- Unit**
5. **B- Materials / Description**
6. **A- Unit Price**
7. **C- Total**
8. **D- Barrower**
9. **A- Tool keeper**
10. **B- Job Order**

WHAT DO YOU NEED TO KNOW?

Self-Check 1.2

1. **A - Vocational School Administrator**
2. **B -Supply Officer**
3. **C - Department Head**
4. **D – Shop Teacher**
5. **B- Tool Keeper**
6. **A – Material Officer**
7. **C– Safety Officer**
8. **A – Store Keeper**
9. **D – Leadwoman**
10. **A – Leadman**

LESSON 2 ANSWER KEYS IN PERFORM MENSURATION

LO1 Select measuring instrument

Pre-Test

1. **A-Voltmeter**
2. **C-Ammeter**
3. **C- Caliper**
4. **D- Micrometer**
5. **B- Thermometer**
6. **A- Meter Scale**
7. **B- Resistance Block**
8. **C- Zero Ohm Adjuster**
9. **A- Range Selector**
10. **D- Needle Pointer**

WHAT DO YOU NEED TO KNOW?

Self-check 1.1

A.

1. D – gauge manifold
2. C - anemometer
3. B- pull push rule
4. A- multi-tester
5. B-clamp meter

B.

1. Protractor
2. Wire Gauge
3. Clamp meter
4. Gauge Manifold or System Analyzer
5. Multi tester

Self-Check 1.2

A.

1. A – protractor
2. D- thermometer
3. C- anemometer
4. D-multi tester
5. C- pull push rule

B. Parts of the Multi Tester

1. Meter Scale
2. Positive Terminal Prod
3. Resistance block
4. Alternating Current Voltage Block
5. Negative Test Prod
6. Name Plate
7. Test Prod Panel
8. Direct Current Voltage block
9. Zero Ohms Ω Adjusting Knob
10. Range Selector

C. Parts of the Clamp Meter

1. Jaw
 2. Trigger
 3. scale panel glass
 4. pointer
 5. Holder
 6. lock
 7. Range Selector
- Holder

LO 2 Carry out Measurement

1. A- Square
2. C- Circle
3. B- rhombus
4. D- triangle
5. A- Trapezoid
6. C- parallelogram
7. A- degree
8. B-Foot
9. D- 2.54 cm
10. A- 0.03937inch

HOW MUCH HAVE YOU LEARNED?

Self Check 2.1

1. 1 METER
2. 1800 CENTIMETER
3. 304.8 MILIMETER
4. 13000 CUBIC CENTIMETER
5. 3500 MILLIMETER

II.

1. $1\frac{3}{16}$
2. $2\frac{3}{8}$
3. $3\frac{7}{16}$
4. $4\frac{3}{4}$
5. $5\frac{15}{161}$
6. $6\frac{1}{2}$
7. $7\frac{1}{8}$
8. $8\frac{13}{16}$
9. $9\frac{1}{78}$
10. $10\frac{11}{16}$

Self- Check 2.2

1. -22,315.52
2. -62,368.38
3. -27,781.6
4. -16,051.2
5. -93,676.8
6. -35,264.00
7. -13,171.20
8. -18,480.04
9. -20.920.80
10. -14,114.10

Self-Check 2.3

A.

1. b

2. a
3. e
4. b
5. b

B.

1. 8 CUBIC FEET
2. 7 CUBIC FEET
3. 10 CUBIC FEET
4. 6 CUBIC FEET
5. 6.5 CUBIC FEET

LESSON 3
INTERPRET PLANS AND DRAWING

LO1 Pre-Test 3.1 Analyze sign ,symbol and data

A.

1. Compressor Motor
2. Cabinet Lamp
3. Thermostat
4. Ground
5. Overload Protector

B.

- 1.T
- 2.T
- 3.T
- 4.T
- 5.T

PRE-TEST –Interpret work plans

A.

1. OVERLOAD
2. BULB
3. RELAY
4. MOTOR COMPRESSOR
5. SWITCH

B.

1. T
2. T
3. T
4. T
5. T

LESSON 4
ANSWER KEYS TO MAINTAIN TOOLS AND EQUIPMENT
PRE-TEST CHECK CONDITION OF TOOLS

A.

1. T
2. T
3. T
4. T
5. T

- B.**
1. D- ELECTRICAL DRILL
 2. A- RECORD CARD
 3. B- BAR CODE
 4. A-INVENTORY SHEET
 5. D- STEEL BRUSH

PRE TEST BASIC PREVENTIVE MAINTENANCE

1. B- LIQUID LUBRICANT
2. A-WATER
3. C-MINERAL
4. A-VEGETABLE
5. D-LUBRICANT
6. A-GANTT CHART
7. B-GASOLINE
8. A-DIESOLINE
9. C-KEROSENE
10. A-THINNER

Lesson 5

**ANSWER KEY TO PERFORMING HOUSEKEEPING AND SAFETY
PRE-TEST SORT MATERIALS , TOOLS AND EQUIPMENT**

1. A-TO AVOID ACCIDENT
2. A. good housekeeping
3. A. hand tools
4. A. circular saw
5. A. accident
6. A. personal protective equipment
7. B. hazard
8. D. reports it to the supervising person on tools and equipment.
9. C. hard hat
10. C. personal protective equipment

PRE TEST IN CLEAN WORKPLACE AREA MATERIALS AND EQUIPMENT

- A.**
1. b. chairs and tables
 2. d. workplace
 3. d. fire exit
 4. c. mechanical oil
 5. a. accident

- B.**
1. T
 2. T
 3. T
 4. T
 5. T

Self- Check 2.1 work area housekeeping

1. A. have safe records
2. D. first aid
3. A. bruises
4. D. carrying objects
5. C. obtain a report/blower
6. C. close circuit television (cctv)
7. C. entrance
8. B. secure area
9. B. barriers
10. A. secure

Pre-test in Systematize Dispensing and Retrieval of Materials, Tools and Equipment.

- | | |
|-------|-------|
| 11. T | 6. T |
| 12. T | 7. T |
| 13. T | 8. T |
| 14. T | 9. T |
| 15. T | 10. T |

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