

PENANG SANGAM HIGH SCHOOL

P. O. BOX 44, RAKIRAKI

LESSON NOTES - 22

SCHOOL: PENANG SANGAM HIGH

SUBJECT: BASIC TECHNOLOGY

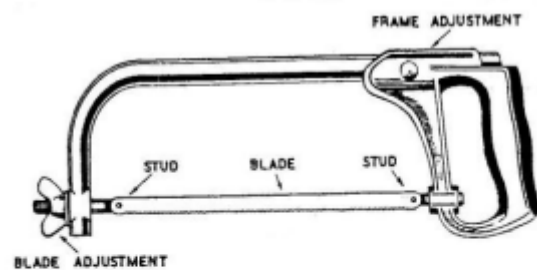
YEAR/ LEVEL: 9

Strand	BT9.4: HAND TOOLS AND MATERIALS
Sub - Strand	HAND TOOLS AND APPLIANCES.
Content Learning Outcome	BT9.4.1.1 Identify the common woodworking and metalworking hand tools, their parts and uses and develop skills in use of the hand tools. BT9.4.3.1 Identify and make appropriate and safe use of readily available timber and leather and the related hand tools; their parts, uses and processes.

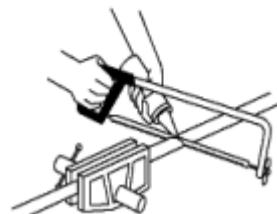
Hacksaws

Are used with the job piece held securely on the vice with the saw held in both hands. The saw must start at the far side at a low angle, and the angle slowly reduced while cutting to keep as many teeth as possible in contact with the work.

It is used for cutting rods, bars, angle plates to required lengths and thick sheet metals to shape



While sawing, use lubricant to reduce friction.

**Spanners**

Are available in a variety of types according to the screws and nuts and the awkward positions in which they may be used. They are used in turning set screws and nuts in the assembly or removing of structural, motor or machine parts

Set spanners

Are made single or double ended with the jaws offset 15 degrees to allow further movement in confined spaces when the spanner is turned over.

**Ring spanners**

Are safer and have better control since nut faces or the corners will not slip.



Tube and box spanners

Are six-sided and safe to use since the side grip on the nut lessens the chances of slipping. It is used for work on nuts in awkward places e.g. spark plugs.

**Adjustable wrench or adjustable spanner**

It is a wrench with a "jaw" of adjustable width, allowing it to be used with different sizes of fastener head (nut, bolt, etc.) rather than just one fastener, as with a conventional fixed spanner.

**Hammers**

Are drop forged cast steel with the head and pein shaped and smooth. The face are hardened to withstand the heavy blows, and tempered to prevent the edges chipping.

Ball pein hammer

It is used for the assembly of parts, and the pein for riveting or hollowing and dishing sheet metals.

**Cross pein hammer**

It is used for forming seams in corners or for hammering metals to a grooved shape.

**Soft-faced hammer**

It is used to assemble finished work. Soft faced hammer prevents finished work from being damaged by hammer blows.

**Mallet**

It is used in place of hammers as they do not damage the metal.

**Tinmans mallets**

Are used for working on flat surfaces, straight and curved edges and for folding seams and edges.

**Bossing mallets**

Are used for shaping sheet metal into concave shapes by beating into sand bag mould.

**Chisels**

Should be used with the job piece held in the vice at elbow height. They are used for cutting or where the amount of metal to be removed is too much for filing.

Flat chisel

It is the common chisel used for general work such as chipping flat surfaces, removing waste metal or cutting thin sheet metal.

**The soldering bit**

May be heated electrically or by flame to sufficiently melt the solder for joining two pieces of metal. It is used to apply solder to a joint.

**Tin-snips**

Are made for cutting thin sheet metal by hand. When using snips, the blades should not be closed fully or a ridged surface will result.

Straight snips

Are used for straight cutting or for curves with waste on the outside.

**Curved snips**

Are used for curve cutting with the waste on the inside of the cut.

**Flat Nose and Long Nose Plier**

Are used for securing flat pieces of metal, or bending wire.

**Combination pliers**

It is the most commonly used pliers and is suitable for holding flat or small cylindrical work, bending and cutting wire.

**Pop rivet gun**

Is a tool with pliers-like handles and nose piece to insert rivets. It is used to insert rivets to join sheet metal material together.



MATERIALS AND HARDWARE

Introduction

Materials come in many forms and are used for various purposes. Materials are refined and processed first before being used and are rarely used in its original form. The most significant feature is the alteration of the properties of the material to suit the purpose.

There are many kinds of materials used for engineering applications.

These three classifications are: metallic, ceramic and polymeric.

All the materials in this book are classified under the following groups:

- Metals –ferrous and non-ferrous.
- Non-metals –wood, ceramics, polymers and leather.
- Composites – concrete, fibreglass and manufactured boards.

Metals

Metals have been extensively used by humans since the early Bronze Age. Metals are normally used to make solid products from cabinets to bridges.



Ferrous metals

Ferrous metals are metals whose main element is iron.

Iron

There is some indication that man-made iron was available as early as 2500 B.C. Today Iron is used in most of our machinery and homes. Iron has greatly developed our manufacturing and building industries.

Steel

These are a few of the many types of steel:





Dead mild steel, Mild steel, Medium carbon steel, High carbon steel and Carbon steel.

Name	Carbon content	Used	Properties
Dead mild steel	0.1% to 0.15%	Car bodies, wires	High ductility and soft malleability
Mild steel	0.15% to 0.3%	Bars, rods, tubing, wire sets	Ductile and malleable
Medium carbon steel	0.31% to 0.8%	crankshaft, springs and cutting tools	increased toughness and hardness
High carbon steel	0.81% to 1.4%	chisels ,files, taps and dies, knives etc	high hardness, tempered to reduce the hardness and increase the toughness.
Carbon steel	Above 3.2% carbon	Cast irons	high compression strength, high fluidity, low tensile strength and are best used for machine base.

Non-ferrous metals

Non-ferrous metals are metals which have no iron and exist in the earth as ores. They are referred to as pure metals; they are mined and processed in metal factories to extract the metal from the ore while the impurities are removed.

Non-ferrous metals are: Copper, Lead, Tin and Aluminum.

Name	Properties	Use	Diagram
Copper	reddish in color, ductile, malleable and a good conductor of heat and electricity	Used in electrical wirings, tips of soldering iron and some decorative purposes	
Lead	is highly ductile, malleable and non-corrosive	Used for soldering electrical circuits and sheet metal joints for containers and pipes.	
Tin	highly malleable and ductile and is resistant to corrosion	used as coating on food cans	
Aluminum	abundant metal ore found on the earth's crust, strong and light	Used in aircraft industry and in many engineering applications, window frames, trusses, radio and television parts and also for food preparation such as wrappers known as aluminum foil.	

Metal Alloys

Metal Alloys contain more than one metallic element. Examples of metal alloys include bronze which is an alloy of copper, zinc and tin.

Non Ferrous alloys

Brass is an alloy of copper and zinc. It has a golden appearance, is harder than copper and costs more than zinc. Brass is used for musical instruments, ornaments, electrical fittings, screws, taps, hinges and door knobs.

TIMBER

Timber is converted to wood which is suitable for building and constructional purposes.

- Hardwood – seeds in fruit and has broad leaves.
- Softwood - naked seeds in cone and usually has narrow leaves.

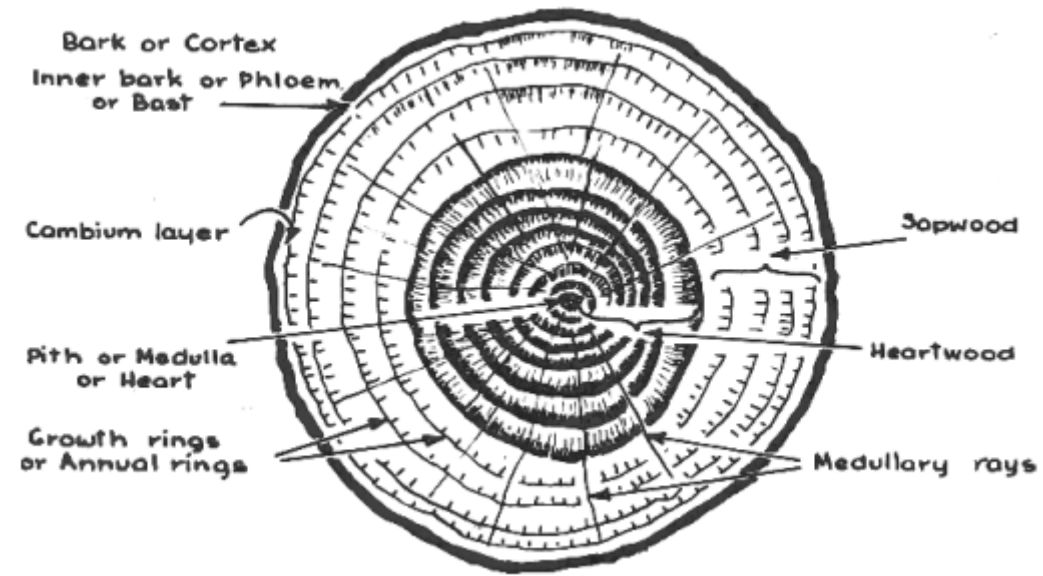
Softwood: Softwoods or coniferous timber are obtained from cone-bearing trees (conifers) such as pines.

Hardwood: These are obtained from broad-leave trees. The structure of hardwoods is more complex than that of softwoods for they have two types of cell: vessels or pores and fibers. Hardwoods are often referred to as pored.

Difference between softwood and hardwood

Softwoods	Hardwoods
Needle-like leaves, cone-bearing pines and firs Usually evergreen	Broad leaves. Usually but not necessarily deciduous i.e. lose leaves in winter.
A branch usually grows in whorls, i.e. more than two at the same level.	Branches usually grow at different levels with one or two at the same time.
Medullary rays are narrow and very light in appearance.	Medullary rays vary from narrow to wide and may be also very light in appearance.
One type of cell (tracheid's) which serves both functions; conduct sap and support the tree. Non-porous i.e. without vessels or pores.	Two types of cells, vessels or pores conduct sap and fibers support the tree. Porous i.e. contains vessels or pores.
Produce uncovered or naked seeds .e.g. pine cone seeds	Produce covered seeds e.g. acorns (oak)
Timber is usually fairly soft and easily worked.	Timber is usually heavy and hard.

Cross section of a tree trunk.



SHORT ANSWER QUESTIONS

1. Name the tool which is used to insert rivets to join sheet metal material together.

2. Define Non-ferrous metal and give two examples of Non-ferrous metal.

3. Name any two types of hammers.

4. Label the diagram given below and state its use.



Name: _____

Usage:

5. Explain the term hard wood and soft wood.

6. Name the metal which contains more than one metallic element.

7. Name the tool which is used for securing flat pieces of metal, or bending wire.

Function of each part

Name	Functions
Sapwood	carries water and mineral salts from the roots of the tree to leaves and other parts of the tree.
Medullary rays	cells that radiate from the center of the tree outwards and act as storage cells and transport food and water horizontally in the tree.
Bark or cortex	helps to act as a protective layer for the inner cells from animal, insects and weather.
Inner bark	passes the food in the form of sap down the tree to the cambium layer. (phloem vessels).
Cambium layer	the growth of new cells takes place here.
Growth rings	determine the age of the tree. The growth is more rapid in favorable conditions such as spring or summer. The differing summer winter growth rates each year produce the growth rings.
True wood	dry sapwood becomes heartwood ; darker and stronger wood in the center of the tree. The main function is to strengthen the tree. The best timber for furniture and building comes from the heartwood of the tree.
Pith	dead cells present in the middle of the tree.

THE END

8. List any two types of steel.
