A Laboratory Manual for

Workshop Practice(WPM) (22004)

Semester- I

Diploma in Mechanical, Chemical & Electronics Engineering

Certificate

This is to certify that, Mr/ Ms. …….

Roll No. …… of First Semester of Diploma in Mechanical Engineering of ----------

(Inst.code:) has satisfactorily completed the term work inthe subject WORKSHOP PRACTICES(22004) for the academic year 20…. to 20…. as prescribed in the MSBTE curriculum.

Place: ……... **Enrollment No. : ……**

Date:…… **Exam. Seat No. : ……..**

Sign:

Name:

Subject Teacher **Head of the Department** **Principal**

Seal of Institution

LIST OF EXPERIMENTS AND PROGRESSIVE ASSESSMENT FOR TERWORK(TW)D-3
ACADEMIC YEAR 20 - 20

Course & code :- **Sub & Code : Workshop Practice(22004)**

Name of Candidate : **Enrollment No :** **Roll No :**

Marks : **Max :** **Min :** **Name of Faculty :**

Sr.No.	SHOP NAME	Page No	Date of Performance	Date of Sub mission	Assess-ment Marks	Date Sing of teacher with Remark
1	Use relevant safety symbol from standard safety chart for a given situation	1-4				
2	To Study of Fire extinguisher	5-8				
3	To understand Workshop Layout	9-10				
4	To perform a Mock drill session of Fire extinguisher	11-13				
5	Identify various fitting tools based on given specifications.	14-17				
6	To study of basic operations of fitting shop	15-25				
7	Prepare job for fitting shop using Marking, Punching, Filing, Chamfering, Sawing etc. operation as per drawing	26-27				
8	Prepare job for fitting shop using Drilling and Tapping operation as per drawing	28-29-				
9	To study of various tools and equipment used in plumbing shop.	30-32				
10	To study of various pipe fittings used in plumbing shop.	33-36				
11	Prepare T joint pipe fitting job	37-38				
12	Prepare elbow joint pipe fitting job	39-40				
13	Prepare bill of material for given pipeline layout	41-42				

14	To study of metal joining processes, tools and equipment.	43-49				
15	To study of Brazing, Soldering and Edge Preparation in Welding.	50-51				
16	To Prepare Lap Joint Using Gas Welding	52-53				
17	To Prepare butt Joint Using Gas Welding	54-55				
18	To Study different types of woods used in fitting shop.	56-58				
19	To Study Equipment and tools used in fitting shop.	59-65				
20	To understandjob involving arc welding	66-67				
21	To prepare utility job involving artificial wood	68-69				
22	To study of tools and equipment in sheet metal shop.	70-73				
23	To prepare Job in Sheet Metal Shop.	74-75				
24	To visit any fabrication/wood working/sheet metal workshop and prepare a report.	76-77				
					Total marks out of ( )	
					Marks out of ( )	

Name and Signature of student **Name and Signature of staff**

Experiment No. 1

Title: Use relevant safety symbol from standard safety chart for a given situation.

General safety rules

1. Safety glasses must be worn.
2. Safety footwear must be worn when working in the workshop.
3. Ask workshop supervisor before using equipment.
4. Clean machines after use.
5. Take care when using compressed air.
6. Hearing protection should be worn when using machinery.
7. Working alone after hours is not permitted

Causes of workshop accidents.

Work shop accidents are unexpected happing that can be harmful to students in the workshop. Workshop accidents are caused when:

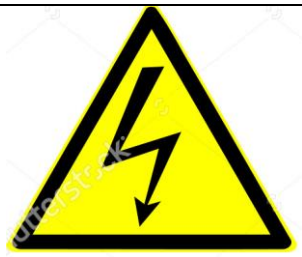
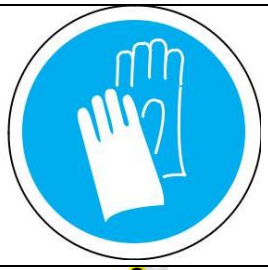
1. Equipments are not properly arranged in the workshop
2. Students are careless when handling equipments
3. Students do not follow the manufacturer's guide handing the equipment
4. Students do not follow the worship safety rules and regulations
5. Students play in the workshop
6. Equipments are faulty due to lack of regular servicing
7. Work out parts of equipmentsis not replaced.

Safety signs and symbols

1.2 First aid

First aid is the immediate treatment or care given to a person suffering from an injury or illness until more advanced care is provided or the person recovers. First aid equipment includes first aid kits and other equipment used to treat injuries and illnesses.

Student Activity:

Sr. No.	Symbol	Meaning or purpose
1		
2		
3		
4		
5		
6		

7		
8		

Conclusion:

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Marks	Dated signature of teacher

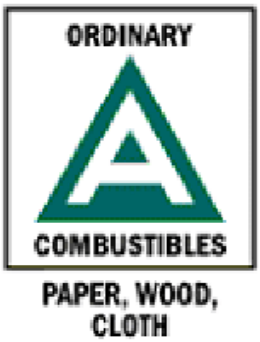
Experiment No. 2

Title: To Study of Fire extinguisher

A fire extinguisher is a storage container for an extinguishing agent such as water or chemicals. It is designed to put out a small fire not a big one. An extinguisher is labeled according to whether the fire on which it is to be used occurs in wood or cloth, flammable liquids, electrical, or metal sources. Using the wrong type of extinguisher on a fire can make the fire much worse. The labels A, B, C, or D are used to indicate the type of fire on which an extinguisher is to be used.

Most fire extinguishers will have a pictograph label telling you which classifications of fire the extinguisher is designed to fight. Pictures shown on the extinguisher in blue represent the type of fire on which an extinguisher is to be used. Pictures shown in black with a red slash across represent the type of fire on which the extinguisher is NOT to be used. For example, a simple water extinguisher might have a label like the one below, indicating that it should only be used on Class A fires.

Tools and Equipments:

NAME OF EXTINGUISHER	APPLICATION	IMAGE
	**Class A** fires involve solid combustible materials of organic nature such as wood, paper, rubber, plastics, etc.	
	**Class B** fires involve flammable or combustible liquids and gases such as gasoline, diesel fuel, paint, paint thinners, and propane. (Class B fires generally involve materials that Boil or Bubble.) The background of the symbol will be either Metallic or Red, if in color.	

	**Class C** fires generally deal with electrical Current. As long as it's "plugged in" it would be considered a class C fire. Examples include fires involving fuse boxes, circuit breakers, appliances, and machinery The background of the symbol will be either Metallic or Blue, if in color.	
	**Class D** fire involves combustible metals such as sodium, potassium, magnesium, and titanium. It takes special extinguishing agents (Metal-X, foam) to fight such a fire. The background of the symbol will be either Metallic or Yellow, if in color.	

Issue and return system of tools, equipment and consumables

1. Tools, and Non consumable materials will be issued/returned by entering/leaving in the Daily issue Register. Staff is authorized to draw the material from Storehouse.
2. Tool kits will be issued/returned to students at the end of the practical. A Tool kit issued/returnedregister as per format attached as Appendix to this standard operating procedure will be maintained to register the particulars of issues
3. For every issued/returned signature of individuals irrespective of the appointment shall be taken.

Student Activity:

Type of fire extinguishers	Application	Symbol
A		
B		
C		
D		

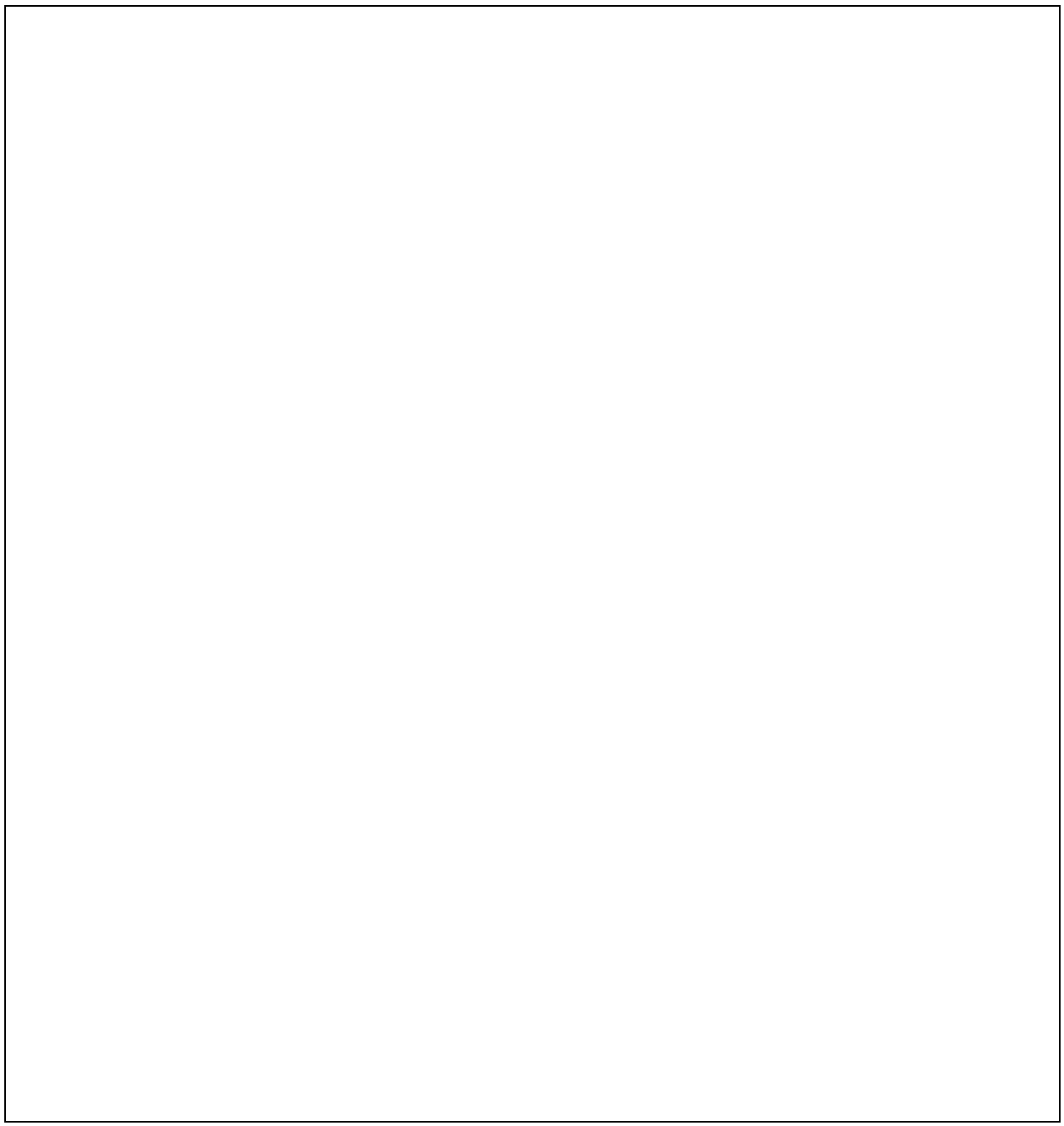
Conclusion:

_____
_____
_____
_____
_____

Marks	Dated signature of teacher

Experiment No. 3

Title: To understand Workshop Layout
Student activity: To draw Workshop Layout



Conclusion:

_____
_____
_____
_____
_____

Marks	Dated signature of teacher

Experiment No. 4

Title: To perform a Mock drill session of Fire extinguisher

A fire extinguisher is a storage container for an extinguishing agent such as water or chemicals. It is designed to put out a small fire not a big one. An extinguisher is labeled according to whether the fire on which it is to be used occurs in wood or cloth, flammable liquids, electrical, or metal sources. Using the wrong type of extinguisher on a fire can make the fire much worse. The labels A, B, C, or D are used to indicate the type of fire on which an extinguisher is to be used.

Most fire extinguishers will have a pictograph label telling you which classifications of fire the extinguisher is designed to fight. Pictures shown on the extinguisher in blue represent the type of fire on which an extinguisher is to be used. Pictures shown in black with a red slash across represent the type of fire on which the extinguisher is NOT to be used. For example, a simple water extinguisher might have a label like the one below, indicating that it should only be used on Class A fires.

Student activity

NAME OF JOB	**Perform mock drill session for extinguishing fire.**
MATERIAL USED	
TOOLS USED	
PROCEDURE	

JOB DRAWING	

Conclusion:

Marks	Dated signature of teacher

Experiment No. 5

Title: Identify various fitting tools based on given specifications.

The bench work and fitting plays an important role in every engineering works, tocomplete and finish the job to the desired accuracy. Though today in most industries most of thework is done by automatic machines and finish to a fairly good degree of accuracy. Still theyrequired some operations to be done by hand to finish them to the desired accuracy. Theoperations commonly used in fitting work may be:

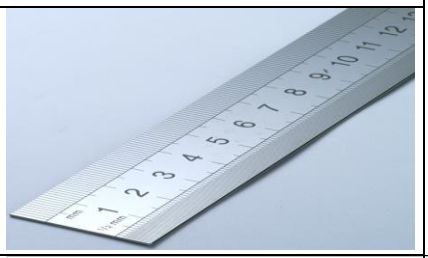
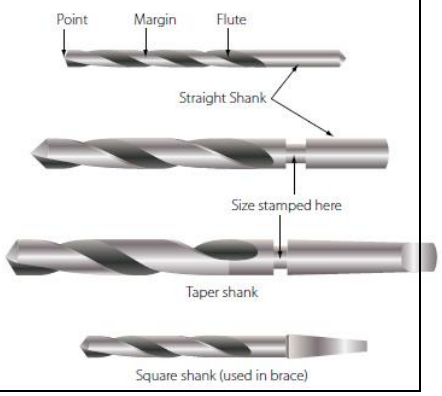
1. Filing
2. Marking
3. Punching
4. Chipping
5. Sawing(cutting)
6. Grinding
7. Drilling
8. Threading(tapping)
9. Scrapping
10. Reaming

Tools and Equipment:

NAME	DESCRIPTION	IMAGE
Bench Vice	The most commonly used vice is the engineers parallel vice sometime called as fitter vice. It must be firmly fitted to bench with the help of wrench screw or nuts and both the vice essentially consists of cast iron body, a fixed jaw, a movable jaw both made up of cast steel, a handle, a square, threaded screw up and nut all made of mild steel, separate cast steel a plates form jaw places are fixed to jaw by steel by means of jaw plates have teeth for holding firmly but this has some disadvantages for soft metals which may be damaged when held firmly between the face protective grips or claps which can be damaged when held firmly between the face protective grips or claps which can be made of land. Fiber tin plates are therefore usually fitted over the jaw to prevent the damaging of the surface of finishing work. The moment of the vice is caused by the movement of the screw through	

Hacksaw	The hacksaw is the chief tool used by the fitter for cutting plates rods, pipes and bars into desired length. It consists of metal frame which may be solid or adjustable. The blade fits over two pegs which project from the sliding in the ends of frame. The wing nut at the front end to the frame is for tensioning the blade.	
Centre punch	The centre punch looks like a point has angles more than that of prick punches the angles usually being 60 degree. The centre punch is needed to mark prick punch marks larger at the same blow of the hammer is needed to mark the point. In its body portion the punch is steel rod 150mm long and 8 to 13 mm in diameter.	
Hammer	The hammer is used to strike the job or tool. A hammer consists of head, face, peen and shaft or handle. The hammer heads are made from plain of about 0.6% carbon and are shaped by stamping and forging. The two ends must be hardened and tempered and the centre of the head with eye is left soft. The size of hammer is indicated by its weight. The various types of hammers in common used are as follows: 1. Ball peen hammer2. Cross peen hammer3. Straight peen Hammer4. Double Face Hammer5. Soft hammer	
Flat Chisel	The flat chisel is the most common of the entire chisel used in engineering. It is chisel, which is used for general chipping operation. It may be used for removing the surface of jobs. The flat chisel should be down to shape shown in diagram wider cutting edge should be slightly curved as soon as this will prevent the common digging in. when it is being used the length of the flat chisel varies from 100 to 400mm which the width of cutting edge varies from 10 to 35mm.	

File	A file is hardened piece of high grade steel with slanting rows of teeth. It is used to cut smooth or fie metal ports. It cuts all metals except hardened steel and it cuts only on the forward stroke. The files are classified according to size, cut of teeth, grade and shape or cross section of the file. **The size of file** is indicated by its length. It is the distance from points to the heel without tong. The length of file is 200mm to 450mm and 100mm to 200mm for finer work. **Shape of file:** The shapes of files according to their shapes or cross-section are classified as shown below: 1. Flat file 2. Square file 3. Triangular file 4. Round file 5. Half round files 6.Knife edge files 7. Hand file 8. Pillar file 9. Warding file 10. Needle file.	
Tap	Taps are made up of high speed steel and taps are usually made in sets of three:1. Taper taps2. Plug taps3. Bottoming taps. According to their specification they are called as roughed, antependia and finished respectively. The ends of the rougher have above six threads tapered. This is used to start the threads so that the threads are formed gradually as the tap is turned into holes. The intermediate is tapered back from the edge about three or four threads. This used after the tapered tap has been used to cut the threads so as possible. The finishes have full threads for whole of its length. This is used to finish work prepared by other two taps.	
Tap Wrench	The upper part of tap wench of the shank ending in the square for holding the tap by a tap wrench. This is two handled wrench and it may be either fixed or adjustable. Wrench may be used for taps of various sizes.	

V Block	V-Blocks are precision metalworking jigs typically used to hold round metal rods or pipes for performing drilling or milling operations. They consist of a rectangular steel or cast iron block with a 90-degree channel rotated 45-degrees from the sides, forming a V-shaped channel in the top. A small groove is cut in the bottom of the "V". They often come with screw clamps to hold the work. There are also versions with internal magnets for magnetic work-holding. V-blocks are usually sold in pairs.	
Angle plate	An angle plate is a work holding device used as a fixture in metalworking. The angle plate is made from high quality material (generally spheroidal cast iron) that has been stabilized to prevent further movement or distortion. Slotted holes or "T" bolt slots are machined into the surfaces to enable the secure attachment or clamping of work pieces to the plate, and also of the plate to the worktable. Angle plates also may be used to hold the work piece square to the table during marking-out operations. Adjustable angle plates are also available for work pieces that need to be inclined, usually towards a milling cutter. Angle plates also may be used to hold the work piece square to the table during marking out operations.	
Steel rule	These are made up of stainless steel and are available in many sizes ranging from 1/2 ft. to 2 ft. These are marked in inches or millimetres. All the faces are machined true. The edges of steel rule should be protected from rough handling.	
Twist drills	A drill is a tool with a rotating drill bit used for drilling holes in various materials. Drills are commonly used in woodworking, metalworking. Special designed drills are also used in medical and other applications such as in space missions. The drill bit is gripped by a chuck at one end of the drill and rotated while pressed against the target material. The tip of the drill bit does the work of cutting into the target material, either slicing off thin shavings (twist drills or auger bits), grinding of small	

	particles (oil drilling), or crushing and removing pieces of the work piece	
Reamers	A reamer is a type of rotary cutting tool used in metalworking. Precision reamers are designed to enlarge the size of a previously formed hole by a small amount but with a high degree of accuracy to leave smooth sides. There are also non-precision reamers which are used for more basic enlargement of holes or for removing burrs. The process of enlarging the hole is called reaming. There are many different types of reamer and they may be designed for use as a hand tool or in a machine tool, such as a milling machine or drill press.	
Marking block	A surface gauge is very useful when finding the centre of a piece of round section material. It is normally used to 'scribe' parallel lines. Its base is heavy and this means it is stable when in used. Surface gauge - gauge consisting of a scriber mounted on an adjustable stand; used to test the accuracy of plane surfaces	
Surface Plate	A surface plate is a solid, flat plate used as the main horizontal reference plane for precision inspection, marking out (layout), and tooling setup. The surface plate is often used as the baseline for all measurements to the work piece, therefore one primary surface is finished extremely flat with accuracy up to 0.00001 in or 250 nm for a grade AA or AAA plate.	
Die	The tool used for cutting external threads on round bars ortubes is called Die.	
Die Stock	The tools for holding and threading die are called asdie stock. The die stock is provided with threading rings. When threaded die is interested into stocks, the threaded rings are lightened so that it engages in drilled holes of to hold it.	

Try Square	It is used for checking squareness of small works	

2.2 Operation of Fitting shops machineries

NAME	DESCRIPTION	IMAGE
Drilling machine	In drilling the job held is vice and other clamping device on the table of the machine. Cylindrical work pieces are mounted by means of gripping plate and V-block. The gripping plate is long enough to fasten by 2 screws at both end with V-bloc and work piece are placed between them. The socket contains drill is fitted in machine spindle and the spindle is lowered by hand level to lightly touched the centre of job already marked out for drilling. Be sure that the point of drill is exactly over the centre of punch mark. The machine is now started and now the rotating drill is gradually pressed into metal to produce a hole. As more of the drill enters the mental see whether the drill is running symmetrically. The pressure on the drill should be relieved frequently otherwise cutting edge of the drill from leaving spilled. Brass and caste iron paraffin and turpentine are used.	

Power saw	A power hacksaw is a type of hacksaw that is powered either by its own electric motor (also known as electric hacksaw) or connected to a stationary engine. Most power hacksaw are stationary machines but some portable models do exist. Stationary models usually have a mechanism to lift up the saw blade on the return stroke and some have a coolant pump to prevent the saw blade from overheating. While stationary electric hacksaw are reasonably uncommon they are still produced but saws powered by a stationary engines have gone out of fashion. The reason for using one is that they provide a cleaner cut than an angle grinder or other types of saw.	
Grinder	A bench grinder or pedestal grinder is a machine used to drive an abrasive wheel (or wheels). Depending on the grade of the grinding wheel it may be used for sharpening cutting tools such as lathe tools or drill bits. Alternatively it may be used to roughly shape metal prior to welding or fitting. A wire brush wheel or buffing wheel can be interchanged with the grinding wheels in order to clean or polish work-pieces.	

Student activity

Name	Use	Diagram
Twist drills		

Angle plate		
Hammer		
Drilling machine		
Tap		

Conclusion:

Marks	Dated signature of teacher

Experiment No. 6

Title: To study of basic operations of fitting shop

1. Chipping:-Chip formation is part of the process of cutting materials by mechanical means, using tools such as saws, lathes and milling cutters. An understanding of the theory and engineering of this formation is an important part of the development of such machines and their cutting tools.

2. Filling:-Methods of filing The following are the two commonly used methods of filing:

1. Cross-filing. This method is used for efficient removal of maximum amount of metal in the shortest possible time. It may be noted that the file must remain horizontal throughout the stroke (long, slow and steady) with pressure only applied on the forward motion.

2. Draw filing. This method is used to remove file marks and for finishing operations. Here, the file is gripped as close to the work as possible between two hands. In this filing method, a fine cut file with a flat face should be used.

3.Scraping:- A hand scraper is a single-edged tool used to scrape metal from a surface. This may be required where a surface needs to be trued, corrected for fit to a mating part, needs to retain oil, or to give a decorative finish. Surface plates were traditionally made by scraping. Three raw cast surface plates, a flat scraper and a quantity of bearing blue (or Red Lead) were all that was required in the way of tools.

4.Grinding:-Grinding is an abrasive machining process that uses a grinding wheel as the cutting tool. A wide variety of machines are used for grinding: Hand-cranked knife-sharpening stones (grindstones), Handheld power tools such as angle grinders and die grinders, Various kinds of expensive industrial machine tools called grinding machines, Bench grinders often found in residential garages and basements.

5.Marking:-Marking out or layout means the process of transferring a design or pattern to a workpiece, as the first step in the manufacturing process. It is performed in many industries or hobbies although in the repetition industries the machine's initial setup is designed to remove the need to mark out every individual piece.

6. Sawing:-A saw is a tool consisting of a tough blade, wire, or chain with a hard toothed edge. It is used to cut through material, very often wood. The cut is made by placing the toothed edge against the material and moving it forcefully forth and less forcefully back or continuously forward. This force may be applied by hand, or powered by steam, water, electricity or other power source. An abrasive saw has a powered circular blade designed to cut through metal.

Sawing is a process wherein a narrow slit is cut into the workpiece by a tool consisting of a series of narrowly spaced teeth, called a saw blade. Sawing is used to separate work parts into two or more pieces, or to cut off an unwanted section of a part.

7. Drilling:-Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. The drill bit is usually a rotary cutting tool, often multipoint. The bit is pressed against the workpiece and rotated at rates from hundreds to thousands of revolutionsper minute.

8. Tapping:-Taps and dies are tools used to create screw threads, which is called threading. Many

are cutting tools; others are forming tools. A tap is used to cut or form the female portion of the mating pair (e.g., a nut). A die is used to cut or form the male portion of the mating pair (e.g., a bolt). The process of cutting or forming threads using a tap is called tapping, whereas the process using a die is called threading.

Both tools can be used to clean up a thread, which is called chasing. However, using an ordinary tap or die to clean threads will generally result in the removal of some material, which will result in looser and weaker threads. Because of this, threads are typically cleaned using special taps and dies made for this purpose, which are known as "chasers".

9. Dieing:-A die is a specialized tool used in manufacturing industries to cut or shape material mostly using a press. Like molds, dies are generally customized to the item they are used to create. Products made with dies range from simple paper clips to complex pieces used in advanced technology.

10. Reaming:-The process of enlarging the hole is called reaming. There are many different types of reamer and they may be designed for use as a hand tool or in a machine tool, such as a milling machine or drill press.

Student activity

Define the following terms

1.Grinding:_____
_____
_____
_____

2.Drilling:_____
_____
_____
_____

3.Tapping:_____
_____
_____
_____

4.Reaming:_____
_____
_____
_____

5.Sawing:_____
_____
_____
_____

Conclusion:

Marks	Dated signature of teacher

Experiment No. 7

Title: Prepare job for fitting shop using Marking, Punching, Filing, Chamfering, Sawing etc. operation as per drawing

Student activity

NAME OF JOB	**Prepare job for fitting shop usinga. Marking b. Punching c. Filing d. Chamfering e. Sawing**
MATERIAL USED	
TOOLS USED	
JOB DRAWING	

PROCEDURE	

Conclusion:

Marks	Dated signature of teacher

Experiment No. 8

Title: Prepare job for fitting shop using Drilling and Tapping operation as per drawing

Student activity

NAME OF JOB	**Prepare job for fitting shop using Drilling and Tapping**
MATERIAL USED	
TOOLS USED	
JOB DRAWING	

PROCEDURE	

Conclusion:

Marks	Dated signature of teacher

Experiment No. 9

Title: To study of various tools and equipment used in plumbing shop.

INTRODUCTION

Plumbing is the system of pipes, drains, fittings, valves, and fixtures installed for the distribution of potable water for drinking, heating and washing, and waterborne waste removal. "Plumbing" also refers to the skilled trade which installs and maintains it. The plumbing industry is a basic and substantial part of every developed economy. The word derives from the Latin *plumbum* for lead, as the first effective pipes used in Roman era were lead pipes."Plumbing" is often denotes the supply and waste system of an individual building, distinguishing it from water supply and sewage systemsthat serve a group of buildings

PLUMBING SHOP - TOOLS

PLUMBING SHOP - TOOLS	**VICE** for holding pipe or tubing for cutting or threading. The pipe is held in curved, V-shaped, serrated jaws or, for larger pipes, by chains.	
	Pipe bending equipment When bending, the outer portion of the workpiece is stretched and its inner portion is compressed. This means that the outer portion is subjected to tension while the inner portion is subjected to compression. Bending may be done by hand or machine. The machines may be hand or power operated. There are two common bending machines.	
	Treading dies cuts smooth, perfectly-formed tapered threads with ease. The powerful reversible ratcheting die wrench, with long 19-inch handle. Die sizes (1/4- to 1-inch NPT) and a powerful ratcheting die wrench, the TEKTON Ratchet Pipe Threader Kit cuts smooth, perfectly-formed tapered threads with ease.	

	Pipe wrench is an adjustable wrench used for turning soft iron pipes and fittings with a rounded surface. The design of the adjustable jaw allows it to lock in the frame.	
	Hacksaw is a fine-toothed saw, originally and principally for cutting metal. They can also cut various other materials, such as plastic and wood for example, plumbers and electricians often cut plastic pipeand plastic conduit with them.	

Student Activity: Write down the use of following tools and equipment's in plumbing shop.

1) **Pipe wrench:**

2) **Hacksaw:**

3) **Treading dies:**

4) **VICE:**

Conclusion:

_____
_____
_____
_____
_____

Marks	Dated signature of teacher

Experiment No. 10

Title: To study of various pipe fittings used in plumbing shop.

PIPE FITTINGS	**Cap** The part of the lamp that connects into the light fitting is generally known either as the "cap" or "base". This provides the electrical contact and also often the physical location of the lamp. A vast variety of caps and bases exist in order to help make sure that only the correct type of lamp is used in any given fitting	
	Elbow It is use to connect pipe at right angle the elbow may be equal size or reducer size. It is made from C.I. G.I. COPPER & PVC materials.	
	Socket A Socket Weld is a pipe attachment detail in which a pipe is inserted into a recessed area of a Valve, fitting or flange. In contrast to buttweld fittings, Socket Weld fittings are mainly used for small pipe diameters (Small Bore Piping); generally for piping whose nominal diameter is NPS 2 or smaller.	
	Nipples a nipple is a fitting, consisting of a short piece of pipe, usually provided with a male pipe thread at each end, for connecting two other fittings. The length of thenipple is usually specified by the overall length with threads.	

	Plug Pipe plugs are defined as cap end of fractional tubes used in a large number of industries. These pipe plugs are designed to insert into the end of tubing to dead-end the flow. Various materials are used to manufacture high quality tube plugs in a variety of end connections.	
	Coupler A coupling (used in piping or plumbing) is a very short length of pipe or tube, with a socket at one or both ends that allows two pipes or tubes to be joined, welded (steel), brazed or soldered (copp er, brass etc.) together. If the two ends of a coupling are different (e.g. one BSP threaded and one NPT threaded), then it is usually referred to as an adapter. Another variation is one plain socket and one threaded socket.	
	Cross Cross are acknowledged globally and used in the sectors like construction, shipbuilding, water supply and gas etc.	
	Bend A pipe bend means a piece of pipe which are bent to some angle to join two piping. They can be nearly any bending radius and angles. Pipe bends are commonly produced on site to meet a specific need by hot induction bending or cold bending.	
	T-shaped It is used to either combine or split a fluid flow. It is a type of pipe fitting which is T-shaped having two outlets, at 90° to the connection to the main line. It is made from C.I. G.I. COPPER & PVC materials.	

	"Y" shaped A fitting with three openings, a wye is used to create branch lines. It is a type of waste fitting tee which has the side inlet pipe entering at a 45° angle, or an angle other than 90 degrees. A standard wye is a "Y" shaped fitting which allows one pipe to be joined to another at a 45 degree angle. It is made from C.I. G.I. COPPER & PVC materials.	
	Reducer allows for a change in pipe size to meet hydraulic flow requirements of the system, or to adapt to existing piping of a different size. Reducers are usually concentric but eccentric reducers are used when required to maintain the same top- or bottom-of-pipe level. It is made from C.I. G.I. COPPER & PVC materials.	
	Union is similar to a coupling, except it is designed to allow quick and convenient disconnection of pipes for maintenance or fixture replacement. It is made from C.I. G.I. COPPER & PVC materials.	

Student activity: Write down the use and symbol of following components

Name of component	Use	Symbol
Cross		

Union		
Reducer		
Elbow		
Plug		

Conclusion:

_____
_____
_____
_____
_____

Marks	Dated signature of teacher

Experiment No. 11

Title: Prepare T joint pipe fitting job

Student activity: Prepare T joint pipe fitting job as per given drawing

MATERIAL USED	
TOOLS USED	
JOB DRAWING	

PROCEDURE	

Conclusion:

Marks	Dated signature of teacher

Experiment No. 12

Title: Prepare elbow joint pipe fitting job

Student activity: Prepare elbow joint pipe fitting job as per given drawing

MATERIAL USED	
TOOLS USED	
JOB DRAWING	

PROCEDURE	

Conclusion:

Marks	Dated signature of teacher

Experiment No. 13

Title: Prepare bill of material for given pipeline layout

LAYOUT DRAWING	

BILL OF MATERIAL	

Conclusion:

Marks	Dated signature of teacher

Experiment No. 14

Title: To study of metal joining processes, tools and equipment.

Introduction

Welding is a process of joining similar metals by an application of heat or without application of pressure and addition of filler material. The result is continuity of homogeneous material of the composition and constituents of two parts which are being joined together.

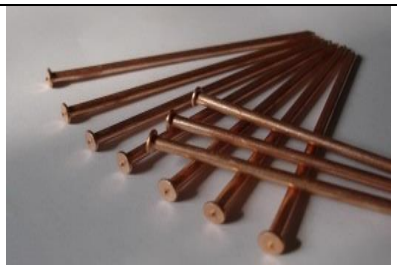
Types of welding:

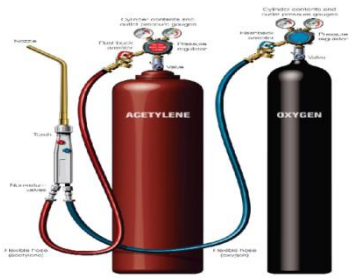
1. Gas welding
2. Arc welding

1 Gas welding

- Oxygen and acetylene together in a flame provide the heat necessary to melt most metals.
- This combined with a neutral welding atmosphere and suitable filler material allows a skilled operator to weld most metals.
- Other fuel gases such as LPG or propane produce a reactive secondary flame that interferes with the molten metal, making them unsuitable for welding.
- These and other fuel gases are suitable for heating and cutting purposes.

Gas welding equipment

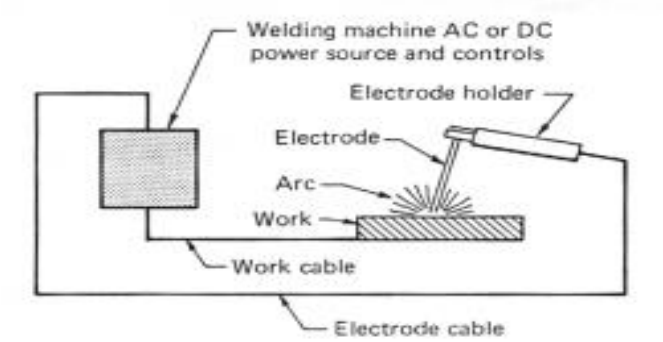
Welding Torch	The torch is the tool that the welder holds and manipulates to make the weld. It has a connection and valve for the fuel gas and a connection and valve for the oxygen, a handle for the welder to grasp, and a mixing chamber (set at an angle) where the fuel gas and oxygen mix, with a tip where the flame forms.	
Welding pin	Weld pins are designed with a long narrow shaft that is spot welded to a metal surface, primarily to fasten duct liner to metal ductwork, or other materials onto metal surfaces.	

Pressure Regulator	A pressure regulator is acontrol valve that reduces the input pressure of a fluid to a desired value at its output. Regulators are used for gases and liquids, and can be an integral device with an output pressure setting	
Oxygen Acetylene cylinder	Acetylene gas is commonly used for gas welding because of its simplicity in production and transportation and its ability to achieve high temperature in combustion (e.g. around 5,000^{o} F).	
Spark lighter	A spark lighter is a tool used to ignite flammable gas appliances such as Bunsen burners, welding torches, and gas grills. A spark lighter produces a spark having sufficient heat to ignite flammable gas vapor	

2Arc welding

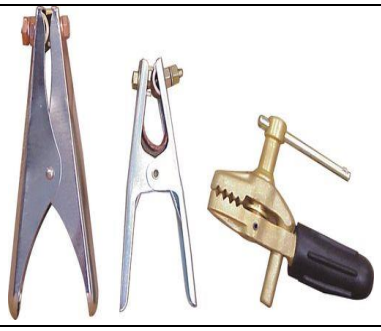
- Arc welding is the most extensively employed method of joining metal parts. The source of heat is an electric arc.
- The arc column is generated an anode which is positive pole of dc power supply & the cathode. When these two conductors of an electric circuit are brought together & separated for a small distance (2 to 4) such that current continues to flow through path of ionized particles called plasma, an electric arc s formed.
- This ionized gas column act as higher resistance conductor that enables more ions to flow from anode to cathode. Generated ions strike the cathode.
- The deposited metal serves to fill & bond the joint to fuse & build up the parent metal surface. The blast of the arc forces the molten metal out of the pool, thus forming a small depression in the parent metal, around which molten metal out of the pool, thus forming a small depression in parent metal, around which molten metal is piled up. This is known as arc creator.
- The distance through the center of arc from tip of the electrode to the bottom

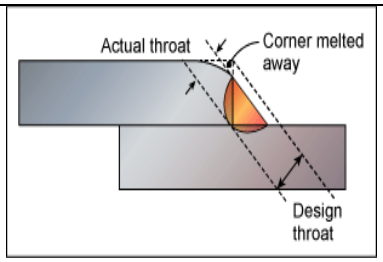
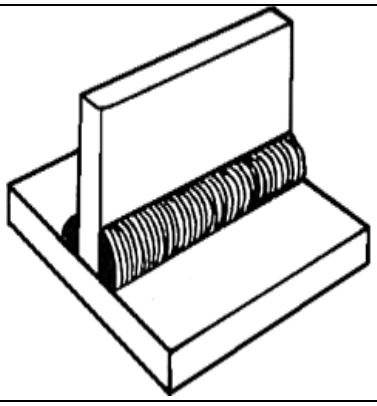
of arc creates is termed as arc length.

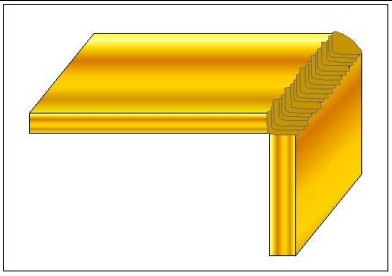
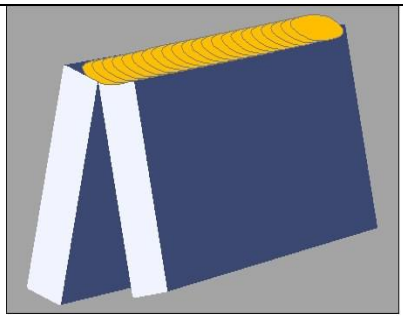


Arc welding equipment

Welding Equipments	**Welding Machine:** It consists of an rectangular steel tank mounted on three tired wheels. The front wheel swiveling & stress able by means of a draw bar. It works on both AC & DC. Transformer reduces supply mains voltage to welding voltage of so. The output of transformer can be varied by rotating on hand wheel which alters the air gap in the core of the choke resulting in steeples regulation of current between 50 and 400.the welding current setting can be directly read at the window top cover. The set can be connected to the lines of 400/440 volts, 3- phase,50 cycle ac supply. It requires about 10gm liters of class B transformer.	
	Electrode: Both consumable & non-consumable electrodes are used for welding. Non-consumable electrode may be made of carbon, graphite or tungsten which do not consume during welding operation. Consumable electrodes may be made of various metals depending upon their purpose & chemical composition of the metal to be welded.	

	Electrode Holder: Electrode holder or stringers come in variety of sizes. They are generally made to size of head which is in twined matched to the amperage output of the arc welder Electrode, we use come in size of range from 50 to 500amps. They are means of securing the electrode to a machine mechanical holder that is easy to use.	
	Cable and Cable Connectors: The cables that carry welding current to the work are very flexible and are generally made of copper and aluminum. Connectors for the electrode lead should be designed that current carrying capacity of the lead will be allowed for welding leads are connected by mechanical connector which is more easily assembled and disassembled.	
	Chipping Hammer: The main implement for chipping the weld bed are the chipping hammers. Chipping hammer is chisel-shaped and is pointed on one end to aid in the removal of slag.	
	Wire Brush: The wire brush which removes small particles or slag is generally made of stiff steel wire embedded in wood. Power wire wheels, when available may be used in place of wire brush	
	Earthing Clamps The earthling clamps that completes the circuit between the electrode and the welding machine, is fastened to the metal being welded either with a clamp a bolt or some other means depending upon size of metal	

	Helmet : The helmet face shield and the hand-held face shield are commonly used in arc-welding. The face shield generally covers the entire face down to the lower throat.Opening that has a shaded lens to stop the infrared and UV rays.	
	Hand Gloves : Long gauntlet gloves should also be used to protect the hands from UV & infrared radiation as well as heat that is given off by the air column.	
	Apron : They should be worn by the welder as it mainly consists of long sleeved cotton shirts & long pants with either no pant cuffs that have been sewn shirt. Shoes should be high topped.	
Types of Welding Joints	**LAP JOINT :** As the name implies is used to join the tow overlapping plates so that the edge of each plate is weld to the surface of the other common lap joints aresingle lap& double lap. Employed for thickness less than 3 mm.	
	T-JOINT : It is used to weld two parts or sectional whose surfaces are at approximately right angles to each other .Plates or surfaces should have good fit up in order to ensure uniform penetration & fusion.	

	CORNER JOINT : It is used to join the edges of two sheets or plates whose surface are at an angle of approximately 90 degree to each other . It is common in the construction of boxes, tanks, frames & other similar items.	
	EDGE JOINT : This consists of joining two parallel **p**lates by means of a weld. This joint is often used in sheet metal work.	

Student Activity: Write Down the use of the Following components

1) **Earthing Clamps:**

2) **Chipping Hammer:**

3) **Wire Brush:**

4) **Electrode Holder:**

5) **Electrode:**

_____
_____
_____
_____

Conclusion:

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_____
_____
_____
_____

Marks	Dated signature of teacher

Experiment No. 15

Title: To study of Brazing, Soldering and Edge Preparation in Welding.

BRAZING:

Brazing is a metal-joining process in which two or more metal items are joined together by melting and flowing filler metal into the joint, the filler metal having a lower melting point than the adjoining metal.Brazing differs from welding in that it does not involve melting the work pieces and from soldering in using higher temperatures for a similar process, while also requiring much more closely fitted parts than when soldering. The filler metal flows into the gap between close-fitting parts by capillary action. The filler metal is brought slightly above its melting (liquidus) temperature while protected by a suitable atmosphere, usually a flux. It then flows over the base metal (known as wetting) and is then cooled to join the work pieces together.[1] It is similar to soldering, except for the use of higher temperatures. A major advantage of brazing is the ability to join the same or different metals with considerable strength.

SOLDERING:

Soldering is a process in which two or more items (usually metal) are joined together by melting and putting a filler metal (solder) into the joint, the filler metal having a lower melting point than the adjoining metal. Soldering differs from welding in that soldering does not involve melting the work pieces. In brazing, the filler metal melts at a higher temperature, but the work piece metal does not melt. In the past, nearly all solders contained lead, but environmental and health concerns have increasingly dictated use of lead-free alloys for electronics and plumbing purposes.

Edge Preparation:

Different edge preparation is particularly used in fusion welding processes for welding butt joints are.

1. SQUARE2. SINGLE-V 3. DOUBLE-V 4. SINGLE-U 5. DOUBLE-U

The preparation edge depends upon the thickness of metal being used for welding.

1. Square butt weld may be used for thickness of 3 to 5 mm. single V butt welds are frequently used thick. The edge forming the joint are leveled to from an included angle
2. 70 to 90 degree depends upon the welding teaching to be used.
3. Double-V butt joint welds are used on metals over 16mm think and where welding can be performed on both sides of the plates.
4. Single and Double-U butt are used on metals over 20mm thick. They are most satisfactory

and require less filler rod; but they are different to prepare.

Student Activity:

1) Write in details steps in brazing process and its applications.

2) Write in details steps in Soldering Process and its applications.

Conclusion:

Marks	Dated signature of teacher

Experiment No. 16

Title: To Prepare Lap Joint Using Gas Welding

Student activity: Prepare lap joint using gas welding as per given drawing

MATERIAL USED	
TOOLS USED	
JOB DRAWING	

PROCEDURE	

Conclusion:

Marks	Dated signature of teacher

Experiment No. 17

Title: To Prepare butt Joint Using Gas Welding

Student activity: Prepare butt joint using gas welding as per given drawing

MATERIAL USED	
TOOLS USED	
JOB DRAWING	

PROCEDURE	

Conclusion:

Marks	Dated signature of teacher

Experiment No. 18

Title: To Study different types of woods used in fitting shop.

Introduction

Carpentry is common term used with any class of work with wood. Carpentry deals with all works of carpentry such as roofs, floors, partitions etc. of a binding building. Timber is the basic material used for any class of wood working. Types of artificial woods:

Type of woods	Figure	Applications
Plywood		Floors, walls and roofs in home constructionsPackages and boxes, Floors, walls and roofs in transport vehicles, High-end loud speakers
Block board		Cabinets, Almirhas and other furniture, Door partitions, Shelves and other interior applications, Roofing, Fencing, and other external applications.
Hard board		Furniture manufacturing Construction Interior furnishings Automotive industries Packaging Poster backing and paneling.
Laminated wood		Rooms, terraces, kitchens, Hotel Floors or dining alcoves etc.

Veener		flat panels such as doors, tops and panelsfor cabinets, parquet floors and parts of furniture.
Fiber Boards		Furniture Industry Home Interior Home Exterior Vapor Barrier and Insulation roofing material shelving units

Student Activity:

TYPES OF WOOD	**OTHER APPLICATIONS**
1) Block board	
2) Fiber Boards	
3) Laminated wood	
4) Plywood	
5) T eakwood	

Conclusion:

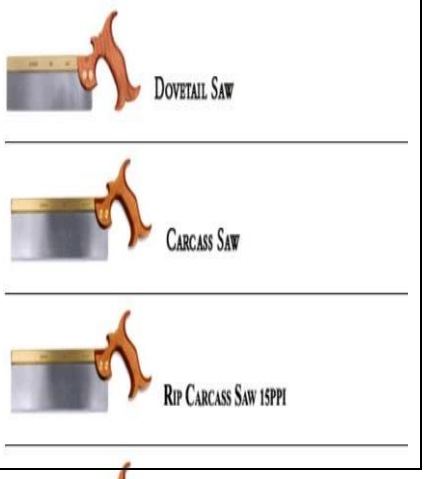
_____
_____
_____
_____
_____

Marks	Dated signature of teacher

Experiment No. 19

Title: To Study Equipment and tools used in fitting shop.

CARPENTRY TOOLS

Marking and Measuring Tools	**Try square:** Try squares are used for measuring marking and testing angles of 90 degrees .Another type is the all metal try square with steel blade and cast iron stock size vary from 150 to 300 mm according to the length of the blade.	
	Mortise gauge: The mortise gauge has two marking points, one fixed near to the end of the stem & the other attached to the brass sliding bar. These two lines cut by teeth are called Mortise gauge lines across wider surfaces	
Planning Tools	**Planes:** The plane can be linked to chisel fastened into a block of metal or wood and blade cuts exactly like wide chisel. The planes in general use are the jack, truing & smoothing planes and are known as bench planes	
	Jack Plane: A jack plane consists of a block of wood into which the blade is fixed by a wooden edge. It causes the sharing's to be curved when they come out.	
Cutting Tools	**Saw:** Cutting across the grain a different action is required from the saw teeth than when ripping with grain. Therefore types of saw are used to as one type cannot do both jobs successfully.	
	Rip Saw: Rip saw are used for cutting along grain in thick wood. The blade is made of high grade tool steel and may be either straight or screw bracket.	
	Cross-cut Saw: cross-cut saws are used for	

	cutting thick wood. They are 600 to 650 mm long with 8 to 9 teeth per 25 mm. The action of teeth is that of series of knives.	
	Panel Saw:-: Panel saw is used for ripping as well as cross cutting. The teeth have slightly more hook than those of cross-cut saw.	
	Tenon or Back Saw: This saw is mostly used for cross-cutting when finer and more accurate finishing is required.	
	Dovetail Saw: A smaller version of teeth tenon. The saw is used where the greatest accuracy is needed and fine shallow cuts to make.	
	Bow Saw: These saws are used for quick cutting curves and as handles revolved can be adjusted to a desired position when to be used.	
	Chisels: wooden chisels most commonly in use include firmer chisel, paring chisels, either square or level edged and mortise chisels.	
	Firmer chisel: The firmer chisel is most useful for general purposes and may be used by hand pressure.	
	Beveled Edge Firmer Chisel: The beveled edge firmer chisel is used for more delicate or fine work. They are useful for getting into corners where the ordinary firmer chisel would be clumsy	
	Mortise Chisel: Mortise chisel is usedfor chopping and mortises. These chisels are designed to withstand heavy work. They are made with heavy deep blade with generous shoulder to withstand the force of smallest blows on the oval-sectional handle.	

Striking Tool	**Warrington hammer:** This type of hammer is mostly used for bench work and all light jobs.	
	Claw hammer: This claw is used for pulling out any nail accidentally bent in driving.	
	Mallet: it is a wooden headed hammer of round or rectangular cross-section.	
Holding Tools	**Bench vice: I**ts one jaw fixed to the side of the table outer part is kept movable by means of screw and handle.	

	C-Clamp: it consists of malleable iron frame can be swiveled and a stead screw to which is fitted a thumb screw.	
	Hand Screw: it is useful where a wider area of pressure provided by G-cramp is required two stead screws fitted to two jaws made of wood.	
Miscellaneous Tools	**Rasp and Files:** They are useful for cleaning up some curved surfaces, for instance, when spoke shave cannot enter small concave shapes file.	

	Oil stone: it is natural or artificial. It is obtained in various grades as coarse medium, fine.	
	Glass paper: it is used where a surface is covered with innumerable minute imperfections so small that no other cutting tool will do then glass paper is aptly used.	
	Pincer: This is mainly used for pulling out nails track set.	
	Screw Drives: it is used for screwing or un screwing screw used in wood work.	

Wood Working Lathe Machine

This machine is employed e primarily for turning jobs in making cylindrical parts by suitably manipulating tools radii and other irregular shapes can be easily twined.It resembles the engine lathe and consists of iron bed of head stock, stock tool, rest, live & dead centers and speed control device.

The driver is motor driven and cone pulley on the headstock spindle is connected by a belt to cone pulley & the motor shaft. The work piece is either clamped between two centers or on a face plate. Long jobs are held between the centers of turned with help of gauge, screw chisel, parting tool. The lathe is supplied together with a number of accessories for marking it useful for variety of

jobs. The size of the wood working lathe specified in terms of the 'swing' of lathe end the maximum distance between centers.

Safe Practices:-

1. Loose clothing should always be avoided.
2. Tools which are not being used should always be kept in their respective Places.
3. The shop floor area should always be kept clean, free from Obstructionslike debris and scrap.
4. No machine should be operated without the permission of shop in charge.
5. Before starting the actual cutting allow the saw to attain full speed.
6. While working on band saw, adjust the guides properly.

Student Activity: Draw neat sketch of following tools and equipmentin fitting shop.

Name	Use	Sketch
C-Clamp		

Bench vice		
Firmer chisel		
Planes		
Try square		

Conclusion:

Marks	Dated signature of teacher

Experiment No. 20

Title: To understandjob involving arc welding

Student Activity: Prepare utility job involving arc welding

MATERIAL USED	
TOOLS USED	
JOB DRAWING	

PROCEDURE	

Conclusion:

Marks	Dated signature of teacher

Experiment No. 21

Title: To prepare utility job involving artificial wood

Student Activity: Prepare utility job involving artificial wood

MATERIAL USED	
TOOLS USED	
JOB DRAWING	
PROCEDURE	

Conclusion:

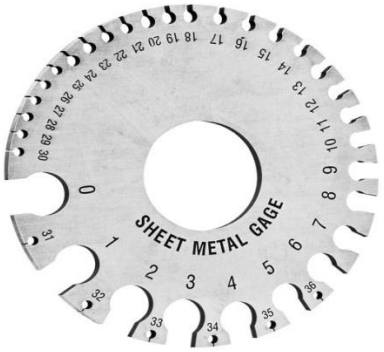
Marks	Dated signature of teacher

Experiment no. 22

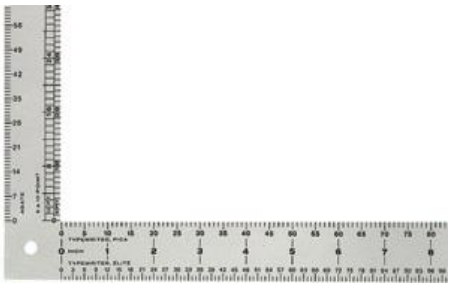
Title: To study of tools and equipment in sheet metal shop.

Sheet metal work is generally regarded as the working of metal from 16 gauges down to 30 gauges with hand tool and simple machines into various forms by cutting, forming into shapes and joining. It as useful trade in engineering works also for day to day requirements. in sheet metal work , the knowledge of geometry metal work, measurements and properties of metal is essential . Examples:- pipes , hoods , funnels hoppers etc.

Basic tools used in sheet metal works

Thickness Gauge	It is used to measure the clearance between the parts during	
Sheet Metal Gauge	It's used to measure the thickness of sheet.	
Dividers	They are used for drawing circles or arcs on sheet metals and also to mark points and divide lines in to equal parts	
Puncher	Its used for marking out work and locating centers.	
Snips and	A snip is used like a pair of supports to cut	

shears	thin , soft metal cutting.	
Pliers	They are used for holding, cutting and bung work	
Rivet set	its used for shape the end of the rivet into a round, smooth	
Straight edge	It's used for scribing long straight line.	
Limit sets	To check whether product lies within specified limits or not.	
Groovers	It is used for flattening and offsetting folded edges in lock seaming.	

Stakes	These are used for bending or forming sheet metal articles.	
Pliers	To hols sheetmetal firmly for soing various operations.	
Trammel	Engineers trammel heads for scribing arc's and circles, Used mainly for marking out sheet work.	
L square	The flat Steel Square is used to layout right angles (90°) and can also be used as a scale. It is an invaluable tool for accurate layout work in pattern drafting.	
Scriber	It's a long wire of steel with it's one end sharply pointed and hardened to scratch lines on sheet metal in laying out patterns it's also called metal workers pencil	

Student Activity: Draw sketches and write use of following tools

Name	Use	Diagram

Trammel		
Pliers		
Straight edge		
Puncher		

Conclusion:

_____
_____
_____
_____
_____

Marks	Dated signature of teacher

Experiment no. 23

Title: To prepare Job in Sheet Metal Shop.

Student activity: Prepare sheet metal utility job using following operations

a. Cutting and Bending b. Edging c. End Curling d. Lancing e. Soldering f. Riveting

MATERIAL USED	
TOOLS USED	
JOB DRAWING	

PROCEDURE	

Conclusion:

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_____

Marks	Dated signature of teacher

Experiment no. 24

Title: To visit any fabrication/wood working/sheet metal workshop and prepare a report.

Student activity: Make a visit and write a report

Industry Name and place
:_____
_

Tools and equipment:
_____
_____

Product manufactured:
_____
_____

Photo of Industry Visit

Report

Conclusion:

Marks	Dated signature of teacher