JSS 1

BASIC TECHNOLOGY

FIRST TERM

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Week 1

Topic: Understanding Technology

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- Introduction
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Introduction

Technology is necessarily not a new concept, it has been in existence for a very long time, but recently, there has been several advancement and modernization that is rapidly occurring, however, technology may be a term that is new to us but generally it is describing something which is not new at all. Technology affects our daily life. We see its effect around us everyday, even though we may not know what it is.

History enabled us to learn that villagers drank water from running streams or rivers or sometimes depended on rainwater whenever it rained. But today, we see wells that have some form of a machine to pump out the water instead of using bucket and rope to draw water. This new development is called technology.

Technology related profession

Technology does not exist in isolation. It exists in relation to men and women, boys and girls that live in a particular community.

The professions related to technology include; Computer Network Operator, Civil engineer, Graphics designer using a recent camera, etc. Further description of these related professions include:

Computer System Analyst

This job is all about understanding how a computer system can best serve a specific company. A computer system analyst may need to choose hardware and software for a company then manage the installation and monitor the outcome. This career came in #4 on the larger list of 100.

Database Administrator

A database administrator will need to organize, store, mine and manage information. They will create specific databases for companies to use but will also be responsible for securing sensitive information. This job came in #6 overall and is also expected to grow quickly as the amount of information a business needs to manage grows.

Software Developer

The software is what makes the hardware work. Consumers and businesses use software every day in computers, smartphones and mobile technology. The growth of mobile technology will continue to drive the grown of software developers. This career ranked #7 overall.

Web Developer

A web developer needs to be able to create a website that looks good and works well. There is a lot more to it than making sure the text is spelled correctly and the checkout cart works. A web developer needs to understand page layout, graphics, design, organization and many other aspects of a website. The internet continues to grow and so this career is expected to continue to grow as well. Web developer ranked #9 on the list.

Computer Programmer

A computer programmer will write, test, debug and maintain software programs. These programs are designed to help the computer perform efficiently. This career came in at #13 overall.

Mechanical Engineer

Mechanical engineering isn't just about being good at math. Designing a device and then turning it into a reality requires creativity and organizational skills. A mechanical engineer will need to do research, design, build and test each device. This career came in at #17 on the top 100 list.

IT Manager

The IT manager is the person to go to with any technical question. This is the person who is responsible for ensuring the front line technicians to quickly solve problems with software and hardware. After all, if the email doesn't work or the computer has an error that employee doesn't get any work done until the problem is fixed. This high-pressure career shows up at #20 on the top 100 list.

Computer Systems Administrator

The computer systems administrator is responsible for making sure the intranet system

works. They ensure that systems that share data are all working and that all computer stations are connected appropriately. This job came in #23 on the list.

Civil Engineer

A civil engineer is in charge of designing and building large structures such as bridges, roads, and buildings. Again math is an important component of this career, but so is creativity. This career came in #26 overall and #9 for technical positions.

Lab Technician

A lab technician may work in a clinic, hospital or research laboratory. These dedicated individuals are responsible for running crucial tests, analyzing data and making recommendations. This career is often in the medical field but is still very technical. Lab technician is #10 for careers in technology in 2013

To sum it up, the demand for IT professionals will continue to grow as well.

Importance of Technology

1. Technology has been a mainstream today, such that we may not be able to do any meaningful thing successfully without using it. The introduction of technology has brought a lot of improvement to our lives and society. The society where products of technology are used daily is always modern in outlook. The standard of living of such a society is very high.

2. Technology isn't just important for today's career training; it is a vital part of contemporary life. From the smartphones that keep us connected to each other to the social media apps that reach out to the global community, the technologies we choose and use allow us to be better students, workers, and citizens. If you're thinking about a new career and are ready to enter a career training program, make certain you choose one that has kept up-to-date with training technologies for the classroom and beyond.

3. *Here are 5 reasons why technology is such an important part of your training and your future career:*

4. Students have different learning styles. If you're the type of person who learns best by doing, then you probably already know that sitting in a lecture hall is an old-fashioned way of learning. You want your classroom instruction to be supplemented by hands-on activities and work outside the classroom. Technology allows instructors to think—and teach—outside the box.

5. Technology is convenient and portable. Backpacks full of books being lugged through crowded hallways is so old-school. You already know that there's a better way of getting content. Tablets can turn volumes of books into pages on a screen and laptops can bring a world of learning to your fingertips.

6. Real world training begins with examples. Whether it's automotive, electronics systems or computer and network technologies, you want the opportunity to work with industry-specific tools and equipment. If you're training in Computer-Aided Drafting and Design (CADD), you want your workstation to be equipped with the same kinds of software used in the industry today. If you're training to be a medical assistant, you want the opportunity to work with simulators that will give you an idea of how you might perform compressions or blood draws on an actual patient.

7. The whole world is your resource when you use technology. A good career training program will reach out to employers to find out what they are looking for in their new hires. It will also continually use technological advances to respond to the needs of the industries and communities it serves. Technology is ever-evolving and the best career training programs use it to adapt to the needs of its students and the workforce.

8. Technology in the classroom gets you ready for technology in the world. The more opportunities you have to use technology, the more comfortable you'll be with it. Once you embrace its limitless potential, you just might start to understand your own potential!

Technology has brought the improved living standard to our society by providing the following amenities:

1. Highways with traffic lights
2. Wide asphalt roads with relevant road signs, marks, and instructions
3. Recreational parks and garden
4. modern building in an urban landscape
5. Treated and drinkable water in public places as well as in homes and offices
6. Use of modern transport facilities like cars, buses, airplane, trains, ships, etc.
7. Modern facilities in the home as found in our kitchen, bathroom, toilet, dining room, living room, surroundings etc.

Exercises

1. State four examples of improvement in our standard of living brought to us by modern technology
2. List five household facilities used in modern building
3. What is the usefulness of traffic lights on our roads
4. List the products of technology that you know

5. Name 3 professions related to technology that you know

Answers:

1.

Highways with traffic lights

Wide asphalt roads with relevant road signs, marks, and instructions

Recreational parks and garden

modern building in an urban landscape

2.

Sound-proof generator

CCTV camera

Vacuum cleaner

Laundry washing machine

Electric hot water tank

3. Traffic light helps to regulate the flow and movement of cars, to prevent auto accidents and traffic jam.

4.

Dishwasher

Mobile phone

Digital camera etc.

5. Computer Network Operator, Civil engineer, Graphics designer.

Week 2

Topic: Safety Guidelines

Outline:

1. Safety guidelines for pedestrians
2. Safety guidelines for cyclist/motorcyclist
3. Safety guidelines for motorist

Safety guidelines are set of rules and regulations put in place to ensure that a person or product is safe and free from danger.

Discussions of safety often include mention of related terms. Security is such a term. With time the definitions between these two have often become interchanged, equated, and frequently appear juxtaposed in the same sentence. Readers unfortunately are left to conclude whether they comprise a redundancy. This confuses the uniqueness that should be reserved for each by itself. When seen as unique, as we intend here, each term will assume its rightful place in influencing and being influenced by the other.

Safety is the condition of a "steady state" of an organization or place doing what it is supposed to do. "What it is supposed to do" is defined in terms of public codes and standards, associated architectural and engineering designs, corporate vision and mission statements, and operational plans and personnel policies. For any organization, place, or function, large or small, safety is a normative concept. It complies with situation-specific definitions of what is expected and acceptable.

Safety Guidelines for Pedestrians

The most important safety tip to reduce pedestrian injuries and fatalities is to pay attention. You can significantly reduce your chances of being in a collision with a motor vehicle by obeying traffic rules and being aware of dangers posed by cars in your vicinity. Make eye contact with drivers if possible and make sure that they can see you.

1. Be Safe and Be Seen: Make yourself visible to drivers

Wear bright/light colored clothing and reflective materials.

Carry a flashlight when walking at night.

Cross the street in a well-lit area at night.

Stand clear of buses, hedges, parked cars, or other obstacles before crossing so drivers can

see you.

2. Be Smart and Alert: Avoid dangerous behaviors

Always walk on the sidewalk. If there is no sidewalk, walk facing traffic.

Stay sober; walking while impaired increases your chance of being struck.

Don't assume vehicles will stop. Make eye contact with drivers, don't just look at the vehicle. If a driver is on a cell phone, he or she may not be paying enough attention to drive safely.

Don't rely solely on pedestrian signals. Look before you cross the road.

Be alert to engine noise or backup lights on cars when in parking lots and near on-street parking spaces.

Safety Guidelines for cyclist/motorcyclist:

There is great concern for the safety of motorcyclists in our roads. Among all users, motorcycle comprise the largest group that is involved in fatal road accidents. Road safety for motorcyclists is a paramount concern, as motorcycle riding requires balancing skills and greater control as compared to car driving. A motorcycle is also less visible and can be easily missed on the road. Furthermore, the body of the motorcycle offers very little protection to the motorcyclist.

Many adults drive every day. It may even be part of your job. It's easy to forget that driving means that you use a lot of skills, often at the same time. Common reasons for motor vehicle injuries include being distracted, having drugs or alcohol in your system, being aggressive when driving, being tired, not wearing a seatbelt and, sometimes, not enough training or the right training. Take smart risks to reduce injuries that have to do with any type of motor vehicle (e.g., car, truck, motorcycle).

Here are important reminders to reduce the risks in motorcycling:

DEFENSIVE RIDING –

What is defensive driving? It is a set of driving skills that allows you to defend yourself against possible collisions caused by bad drivers, drunk drivers, and poor weather. If you look ahead and keep your eyes moving, you will spot potential hazards more easily. Once you have identified a potential hazard and decided what to do, act immediately.

Year after year, statistics show that motorcycles remain the most vulnerable group among all road users. To enhance safety, motorcycles and all motorists should follow these basic traffic rules and regulations:

- Keep to your left, unless you are overtaking
- Never ride when you've been drinking

- Keep a safe distance from other vehicles
- Do not swerve in and out of traffic
- Don't overtake a convoy of vehicles
- Don't speed
- Slow down when approaching a bend
- Anticipate pedestrians who may dash across the road
- Stay on the lookout for children and animal that may dart out unexpectedly
- Practice the 2-Second Rule: allow for two seconds between braking and making a full stop behind a vehicle
- Get out of a car's blind spot
- How pedestrians are to cross the road:
- Be Careful at Crossings; Look before you step
- Cross streets at marked crosswalks or intersections, if possible.
- Obey traffic signals such as WALK/DON'T WALK signs.
- Look left, right, and left again before crossing a street.
- Watch for turning vehicles. Make sure the driver sees you and will stop for you.
- Look across ALL lanes you must cross and visually clear each lane before proceeding. Even if one motorist stops, do not presume drivers in other lanes can see you and will stop for you.
- Don't wear headphones or talk on a cell phone while crossing.

Exercise:

- Mention 4 ways a pedestrian can be seen and safe on the highway
- Mention 2 ways a pedestrian can be smart and alert to avoid dangerous behaviour on the road
- Mention 4 ways a motorcyclist can be safe on the highway
- Explain how a pedestrian is expected to cross the road
- What are Safety guidelines?

Answer:

1.

- Wear bright/light colored clothing and reflective materials.
- Carry a flashlight when walking at night.
- Cross the street in a well-lit area at night.
- Stand clear of buses, hedges, parked cars, or other obstacles before crossing so drivers can see you.

2.

- Always walk on the sidewalk. If there is no sidewalk, walk facing traffic.
- Stay sober; walking while impaired increases your chance of being struck.

3.

- Keep to your left, unless you are overtaking
- Never ride when you've been drinking
- Keep a safe distance from other vehicles
- Do not swerve in and out of traffic

4.

- Cross streets at marked crosswalks or intersections, if possible.
- Obey traffic signals such as WALK/DON'T WALK signs.
- Look left, right, and left again before crossing a street.
- Watch for turning vehicles. Make sure the driver sees you and will stop for you.
- Look across ALL lanes you must cross and visually clear each lane before proceeding. Even if one motorist stops, do not presume drivers in other lanes can see you and will stop for you.
- Don't wear headphones or talk on a cell phone while crossing.

5. Safety guidelines are set of rules and regulations put in place to ensure that a person or product is safe and free from danger.

Week 3

Topic: Workshop Safety (1)

Outline:

- Causes of workshop accidents
- Types of workshop
- Prevention of workshop accidents

Meaning and causes of workshop accidents/hazards

Accident is defined as an unfortunate incident that happens unexpectedly and unintentionally, typically resulting in damage or injury. This then mean that any harm or injury that is done to a student while s/he is in the workshop on a machine is called an accident. Accident or hazard could be man-made or natural while it could also be accidental or deliberate. An accident is a negative experience that happens to somebody when he does not expect it.

The workplace can be dangerous, even more so in an industrial environment. Numerous factors can cause accidents, ranging from overexertion to mishandling of hazardous materials. There are also a multitude of variables that can contribute to or influence a workplace incident. Think about this; 80 of every 100 accidents that happen in the workplace are ultimately the fault of the person involved in the incident. What does this tell us? Students are not taking the proper precautionary measures before working, or they are simply too lazy to be bothered with it

Now, accidents in the workshop can occur or are caused when:

- Student's do not follow the manufacturer's or teacher's instruction on how to use the machine in the workshop;
- Students are not careful enough in the workshop while handling the machines;
- Student's play rough in the workshop;
- The machines being used are not in good form because they are not serviced regularly;

- The worn-out parts of machines are not replaced on time.

Accident prevention technique:

These are proactive steps to be taken in order to prevent workshop accidents from happening. Some of the steps are discussed below:

Routine checking – this involves checking all machines to ensure that they are good condition before setting them up for use.

Routine servicing – it involves servicing all machines and changing the worn out parts regularly so that they can work effectively.

Students' comportment – students should avoid noise-making and talkativeness in the workshop because this can make them lose concentration on the work they are doing.

Preventive measures – electric equipment should be used with voltage stabilizers in order to prevent electrical fire as a result of power surge

Teacher's supervision – to prevent workshop accidents, every workshop lesson or session should be supervised by the teacher. Students should not be left to themselves in the workshop.

The technique of preventing workshop accidents involve both the teachers and the students. With the suggested steps to be taken by both of them, safety can be achieved in the workshop. Experience and research have proved that it is wiser and cheaper to prevent an accident than trying to solve the problem caused after an accident has happened.

Exercises:

1. State three (3) roles a student should play in preventing workshop accidents
2. State one (1) role a teacher should play in preventing workshop accidents
3. Which is better – to prevent an accident or to solve the problems caused by the accidents?
4. Explain the term workshop accidents
5. What can cause a workshop accident?

Answers:

1.

Students should follow the manufacturer's or teacher's instruction on how to use the machine in the workshop;

Students should be careful enough in the workshop while handling the machines;

Students should not play rough in the workshop;

2.

Teacher's supervision – to prevent workshop accidents, every workshop lesson or session should be supervised by the teacher. Students should not be left to themselves in the workshop.

3.

Experience and research have proved that it is wiser and cheaper to prevent an accident than trying to solve the problem caused after an accident has happened.

4. Workshop accidents are unexpected injuries that happen to students in the workshop.

5. Workshop accidents can be caused by student's carelessness or mechanical fault from machines.

Week 4

Topic: Workshop Safety (II)

Outline:

1. Safety rules and regulations in workshop
2. Safety devices
3. Fire

Safety rules and regulations in workshop

Before you can use equipment and machines or attempt practical work in a workshop you must understand basic safety rules. Workshop safety is everyone's responsibility, the following rules have been put in place to ensure the safety of all students and staff. These rules will help keep you and others safe in the workshop, please read the safety rules carefully before entering the workshop.

Workshop rules

- Student affected by drugs or alcohol are not permitted in the workshop
- Students with any health problems that may affect workplace safety (e.g. medication, epileptic fits) must report these conditions to the workshop staff
- Notify the workshop staff of your arrival
- No food or drink in the workshop
- Wear the correct protective equipment for the tools you are using – ask if in doubt
- All chemicals (e.g. glues and paints) must be checked through Chemwatch and with workshop staff before use
- Immediately notify the workshop supervisor of any faulty or broken equipment
- Ask how to use the tools safely
- Make sure your work piece is fixed securely before work commences
- Keep leads up off the floor
- Keep clear of any person operating tools and machinery (bumping an operator or get tangled in the lead could cause serious injury to you or the operator)

- Do not talk to anyone operating electrical equipment and machinery
- Keep your work area tidy
- Clean up any spills immediately
- Wash hands after using equipment and materials

When entering workshop

Pick up your hearing and eye protectors and immediately report to the workshop supervisor.

When exiting the workshop

Check that any tools you have been using have been put away in the appropriate spots, cleaned up your work area and notify the workshop staff.

Clothing & footwear

- Safety glasses and hearing protection – every person entering the workshop must collect these items from just inside the door. They must be worn at all times.
- Students that wear glasses should be aware these are not safety glasses, they are only impact resistant and may shatter, safety glasses must be worn.
- All loose clothing (eg shirts hanging out) must be tucked in.
- Safety boots or enclosed shoes must be worn in the workshop. Do not enter under any circumstances without this footwear, there are no exceptions to this rule.
- Long hair has to be tied up including fringes.
- Remove rings and loose jewellery before operating machinery they can be a hazard.

Behaviour

Fooling around and practical jokes in the workshop will not be tolerated. These students will be told to leave.

First Aid

All accidents, cuts and abrasions must be reported before leaving the workshop. If an accident does happen, no matter how small, it must be reported to the workshop staff and an Accident Report Form filled out. Filling out this form is imperative for any future complications resulting from an accident.

Fires or other emergencies

Think before reacting to any emergency in the workshop, ensure you are reacting safely

before you assist in an emergency. Do not attempt to fight any fire unless you have been trained to do so.

Machinery usage

When students are operating machinery all other students are to stay clear and not to talk to the operator. If you feel uneasy or unsafe operating any tools or machinery in the workshop, inform the workshop supervisor and help will be provided.

Machinery that students are not allowed to operate includes:

- Drop Saws
- Sac Panel Bench Saw
- Thicknesser
- Bench Rip Saw
- Lathes
- Pressure Testing Machine
- Milling Machine
- Plastic Moulder
- C.N. Router
- Circular Saws
- Laser

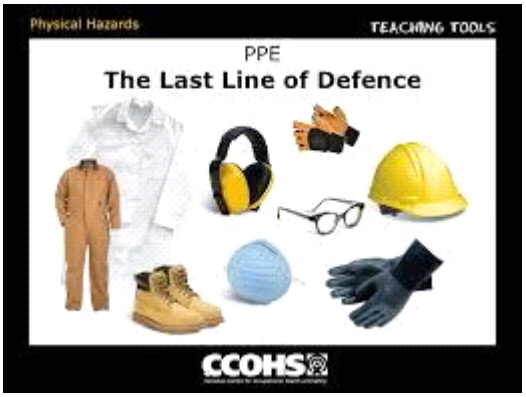
Tools to be used only under strict supervision include:

- Router and Trimmer.
- All other tools may be used by students as long as they have been inducted into the workshop, and been tested in there capability to use them.
- Records are kept as to which tools each student can operate.
- Students are not permitted in the office of the workshop.
- If tools are required, ask the work supervisor.

Safety devices

A workshop is a building or area where engineering work is carried out. A workshop must meet certain safety standard for approval before they can function as an engineering

workshop. In order to maintain safety in the workshop during workshop practical sessions, certain devices must be provided to students to use these are called safety devices which help in different ways. Some of the devices are used to protect the delicate parts of the students body such as the eye, the nose, the chest, the head, the legs and the hands. The protective safety devices include the glove to protect the palms and the fingers, the shield to protect the eyes, boots to protect the legs, the feet and toes, the helmet and the overall to protect the chest.



Examples of safety devices.

All safety devices are generally referred to as ' Personal Protective Equipment' (PPE). These PPEs include the following:

1. Goggle and Eyelids: These equipment protect the eyes during welding and grinding operations.

2. Lab coats and Boots: Students and teacher are expected to change into these attires before starting work at the workshop. The boot protects against any sharp object on the floor.

3. Helmet: This device is needed where heavy machines are suspended. This is a must in all

construction companies.

4. Sand bucket: This is used to handle fire outbreak in the absence of fire extinguisher.

5. Nose cap: This is the device that protects against dust and fumes in the workshop.

6. First Aid Box: In the workshop, a first aid box must be present in an event that an accident does occur, for minor injuries.

Furthermore, in a workshop, the following layout should be strictly maintained in order to promote safety:

(i). Uncongested working area.

(ii). Adequate ventilation and lighting.

(iii). Safe storage for tools and stacking of materials.

(iv). A clear gang way.

(v). Provision of toilets, dressing room and bathroom.

Fire:

Fire in simple terms is a chemical reaction that gives off light and heat. It is an example of the chemical process of oxidation. Fire is very destructive and should be avoided in a workshop.

The fire triangle is used to show the rule that a fire needs three things to burn. These things are heat, fuel, and oxygen. If one of these three is removed, the fire will be put out. In the middle of the fire triangle, there is also a chemical reaction.

Fire Triangle

Without heat, a fire cannot begin. If fire becomes cool enough, it will not keep burning. Heat can be removed by using water. This only works on some types of fire. Separating burning fuels from each other can also reduce the heat. In forest fires, burning logs are separated and placed into safe areas where there is no other fuel. Turning off the electricity in an

electrical fire removes the heat source, but other fuels may have caught fire. They will continue burning until the firefighters deal with them and their fire triangles. Without oxygen, a fire can not start. Oxygen may be removed from a fire by covering it in some way. Some foams and heavy gases (for example, carbon dioxide) are often used for this. The fire can also be closed off away from a source of oxygen. Once all the oxygen in the closed off area is used by the fire, it will go out if it cannot get more oxygen because it needs oxygen.

Fire can be ignited (caused) in different ways; there are two types of fire namely:

1. Electric fire
2. Chemical fire

Electrical fire: Electrical sparks and electric current fluctuation can cause a fire outbreak in a workshop. When this happens, the electric cables are melted and many items are destroyed. While **chemical fire** can be ignited when inflammable chemicals are struck. Chemicals like sulphur, petrol, kerosene, easily catch fire when naked light is brought near them.

Exercises:

1. Describe an electric spark
2. State three (3) inflammable substances that can be found in a workshop
3. State three (3) precautions to be taken to avoid fire outbreak in a workshop
4. State three safety devices you know
5. Name the two types of fire

Answer:

1.

Electrical sparks happen when there is an electric current fluctuation. When this happens, the electric cables are melted and many items are destroyed.

2.

Substances like sulphur, petrol, kerosene

3.

Naked fire should not be taken close to inflammable materials

Electricity should be used with a good functional stabilizer

An original fire extinguisher should be available in the workshop at all time.

4. Helmet, Eyelids, Nose cap.

5. Electrical and Chemical fire.

Week 5

Topic: Properties of Materials (Wood)

Outline:

1. Identification
2. Classification

Identification

Technological advancement over the years has taken several shapes, sizes, and form. The materials used in creating a technological piece include wood, metals, ceramics, rubber, and plastics; these materials come in different forms and each form performs unique functions. We will be studying as many as we can, but starting first with wood.

Wood

Woods are identified by:

a. Their colour

b. Their classification into soft and hardwoods; Their property e.g. hardwood has broad leaves while softwood has needle-like leaves.

There are trees all around us. Some are big while some are small. The major parts of the trees are leaves, branches, trunk (stem) and roots. When the tree is allowed to remain for a long time, its trunk (stem) becomes bigger and the tree grows taller.

Image of the trunk of a tree

The tree trunks are cut into wood or timbre. The wood is used to make furniture cabinets, house roofs, etc.

The different types of wood differ in terms of colour density hardness and other properties.

Hard and Softwoods

Hardwood does not necessarily mean something unbreakable and unbendable, it simply means that they are brought out of deciduous trees. These are trees that shed their leaves in the dry season to prevent water loss. Examples of such trees are Iroko, Afara, Mahogany, Opepe, Omo, etc. These trees have broad leaves. Hardwood is used for furniture making and building construction.

Image of deciduous tree that produces a hardwood

Image of evergreen (coniferous) trees that produce softwood

Softwood is obtained from coniferous trees. These are trees that bear naked seeds called cones. They are also called evergreen trees because they do not shed their leaves in dry season. These trees grow better in temperature regions (i.e. cool regions of the world) of the world. Examples are spruce, pines, cedar, cypress, etc.

Exercises:

1. State the classes of wood
2. Describe the coniferous trees and deciduous trees
3. Name three major parts of a tree

4. What identifies a wood?
5. What is a hardwood?

Answers:

1. Woods are classified into two i.e. Soft wood and hard wood
2. Coniferous trees are trees with needle-like leaves from which softwood is produced while deciduous trees are trees with broad leaves from which hardwood is produced
3. The three major parts of a tree are leaves, branch, trunk, root
4. Woods are identified by (a) Their colour (b)Their classification into soft and hardwoods; Their property e.g. hardwood has broad leaves while softwood has needle-like leaves.
5. Hardwoods are brought out of deciduous trees. These are trees that shed their leaves in the dry season to prevent water loss.

Week 6

Topic: Properties of material – wood – (contd)

Outlines:

- properties
- Uses

Introduction:

Wood is a porous and fibrous structural tissue found in the stems and roots of trees and other woody plants. It is an organic material, a natural composite of cellulose fibers that are strong in tension and embedded in a matrix of lignin that resists compression. Wood is sometimes defined as only the secondary xylem in the stems of trees, or it is defined more broadly to include the same type of tissue elsewhere such as in the roots of trees or shrubs. In a living tree, it performs a support function, enabling woody plants to grow large or to stand up by themselves. It also conveys water and nutrients between the leaves, other growing tissues, and the roots. Wood may also refer to other plant materials with comparable properties, and to material engineered from wood, or wood chips or fiber.

Wood has been used for thousands of years for fuel, as a construction material, for making tools and weapons, furniture and paper, and as a feedstock for the production of purified cellulose and its derivatives, such as cellophane and cellulose acetate.

In 2005, the growing stock of forests worldwide was about 434 billion cubic meters, 47% of which was commercial. As an abundant, carbon-neutral renewable resource, woody materials have been of intense interest as a source of renewable energy. In 1991 approximately 3.5 billion cubic meters of wood were harvested. Dominant uses were for furniture and building construction.

Wood is a porous material made up of cells of various kinds, depending on the nature of these cells, some woods have more or less solid wood substance for a given sized piece. So with wood, the fewer holes (cells), the more wood substance.

Physical Properties:

Density

The amount of wood substance for a given volume determines density. Woods with more weight for a given volume have a higher density than woods with less weight. Both weight and volume of wood are affected by the amount of moisture it contains. Therefore, when

specifying density it is important to also state moisture conditions.

Moisture

Free Water and Bound Water:

Water exists in wood as either free water or bound water. Free water occurs within a cell cavity as a liquid. It is the easiest and first to be removed during drying. This free water moves toward the end surfaces through connecting cells, and laterally through the pits of neighboring cells. Bound water is moisture absorbed within the cell wall. This water is molecularly bound to the wood molecules of the cell. It is therefore much more difficult to remove than free water.

Other Properties Affecting Strength

Slope of Grain

This refers to a deviation of the line of longitudinal cells, to a straight line parallel to the sides of the piece of lumber. It may be caused by an abnormal growth pattern in the tree, or how the log was sawn. It is usually expressed as a ratio; for example, 1 in 12 (finch of slope in 12-inches length). A slope of grain of 1 in 6 results in a 60 percent reduction in bending strength (strength of a horizontal beam, such as a floor joist, for example). A 1 in 16 slope causes only a 20 percent reduction (see Figure 7). Most lumber grading rules specify the maximum slope of grain permitted in the grade.

Knots

Knots, common in sawn products, are caused by limbs on the tree stem. When a saw cuts through a limb (or its stub) a knot remains. Depending on the angle of both the limb and the saw, a round knot, an oval knot, or a spike knot (longitudinal) will result. For strength purposes knots are classified by size, number, form, and quality. The first two classes are self-evident. Knot form and quality are described as: tight, loose, intergrown, firm and rotten. Most grading rules take these factors into account.

Shakes and Checks

These are separations occurring in the wood (see Figure 10). Shakes parallel to the annual rings are called ring shake and those in the heart of the tree and perpendicular to the annual rings are called star shake. In living trees, both forms of shake are caused by wounds, but not all wounds result in shake. Factors that may extend the formation of shake are internal growth stresses, bending of the tree by wind and the freezing of free water within the cells. Checks are generally produced in the rays of sawn-wood products during drying. Depending on their severity, checks and shakes have a very great effect in reducing the strength of wood.

Uses:

The Many Uses of Wood:

Wood is a highly versatile material and has a long history of use. Despite the availability of alternative materials, wood remains preferred choice when it comes to a variety of things and applications. Here are only a few of many uses of wood:

- Furniture and flooring.
- Construction and shipbuilding.
- Art.
- Music instruments e.g. Piano, violin, cello, drums, flute, guitar, double bass and a number of other musical instruments are made from wood.
- Dishes and utensils.
- Tools.
- Sports equipment and toys.
- Fuel.

Exercises:

1. Define the term wood
2. Is wood a porous or nonporous material?
3. Mention two (2) properties of wood
4. How does water exist in wood
5. Mention four uses of wood

Answer:

1. Wood is a porous and fibrous structural tissue found in the stems and roots of trees and other woody plants. It is an organic material, a natural composite of cellulose fibers that are strong in tension and embedded in a matrix of lignin that resists compression.

2. Wood is a porous material

3. Density and moisture

4. Water exists in either free or bound way

5. Wood can be used for: furniture, flooring, construction, art.

Week 7

Topic: Identification of Metals

Outline:

- Meaning of metals
- Properties of metals
- Forms of metals

Meaning of Metals

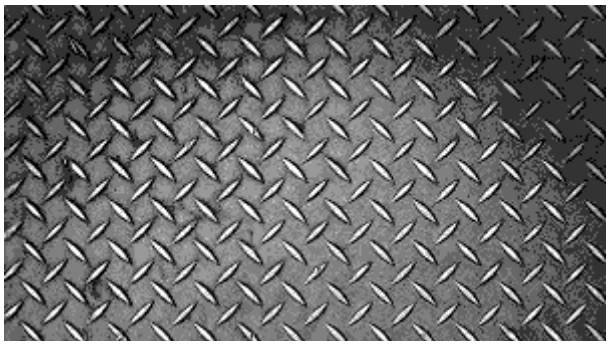
We have been discussing several materials that are very essential in the construction of technology, and this week we are going to be discussing another important material which is metal. Metals are another material used in the construction of things and they can be identified using their identity, colour/lustre, fusibility, magnetic effect, conduction of heat and sound.

A metal is a material (an element, compound, or alloy) that is typically hard when in a solid state, opaque, shiny, and has good electrical and thermal conductivity. Metals are generally malleable—that is, they can be hammered or pressed permanently out of shape without breaking or cracking—as well as fusible (able to be fused or melted) and ductile (able to be drawn out into a thin wire). About 91 of the 118 elements in the periodic table are metals; the others are nonmetals or metalloids. Some elements appear in both metallic and nonmetallic forms.

Scientist use the term “metal” to collectively describe all elements other than hydrogen and helium, the simplest two, in a star. The star fuses smaller atoms, mostly hydrogen and helium, to make larger ones over its lifetime. In that sense, the metallicity of an object is the proportion of its matter made up of all heavier chemical elements, not just traditional metals.

Many elements and compounds that are not normally classified as metals become metallic under high pressures; these are formed as metallic allotropes of nonmetals.

The strength and resilience of metals has led to their frequent use in high-rise building and bridge construction, as well as most vehicles, many home appliances, tools, pipes, non-illuminated signs and railroad tracks. Precious metals were historically used as coinage.



Properties of identification of metals

Density

This property describes how heavy or light is a given substance. Density is measured by dividing the mass of the metal by one cubic metre of that metal. For instance, 1 cubic metre of steel weighs 8000 kilograms. That means, the density of steel is 8000kg/m3. The density of water is 1000kg/m while aluminum has a density of 2800kg/m3. That means aluminum is lighter than steel but heavier than water. Plastics are much lighter with a density of 900kg/m3.

Colour/Lustre

When a material is polished, it shines. Different metals show different colours when they are polished.

Fusibility

Metals can be melted until they become liquid. The temperature is at which solid metal melts is called the melting point. This temperature is different for different metals e.g. for cast iron, the melting point is 1241oC, while it is 2005oC for wrought iron.

Magnetic Effect of Metal

When a magnet picks or sticks to a material, the material is said to be magnetic. Non metals are generally non-magnetic. For example, wood, ceramics, plastic,etc. are not magnetic. Also, not all metals are magnetic. Only metals that have iron in them are magnetic. These metals are called ferrous metals. Other metals are called non-ferrous metals.

Conductivity of Heat

A heat exchanger is a common application where good thermal conductivity is important. Copper is a popular choice for heat exchangers in industrial facilities, air conditioning, refrigeration, hot water tanks and under-floor heating systems, its high thermal conductivity allows heat to pass through it quickly.

Testing the rate of heat conduction of a bar of metal. Place a lead solder or wax at the end of a bar of copper. Heat the bar at one end and record the time it takes for the solder or wax to start to melt. Repeat the experiment using other materials such as brass, aluminum and steel with the same diameter and length as the copper bar. Record in each case the time it takes to melt the lead solder or wax. Tabulate the result as shown below:

Material	Time taken (minutes)
A	
B	
C	
D	

Using your result, arrange the materials from the best to the poorest heat conductors. Discuss the result with your teacher.

Sound Test

Metals produce different sounds when they are hit with a hammer. A bell made of brass will produce sound that is different from a bell made of iron. If you want to find out the rate of conductivity of different metals, the following experiment should be conducted.

Classes of Metals

Some metals are ferrous metals and others are non-ferrous metals contain no iron at all.

Ferrous Metals	Non-Ferrous Metals
Wrought Iron	Brass
Cast Iron	Aluminum
Steel	Copper

Forms of Metals

Metals also come in different forms. They could be round, rectangular, tubular, flat plates, strip, wires, etc.

Exercises

1. Define the term metal
2. List five forms of metal

3. State the two general ways of classifying metals

4. State four methods of identifying metals

5. Which one of these conduct heat better – metals or non-metals

Answer

1. A metal is a material (an element, compound, or alloy) that is typically hard when in a solid state, opaque, shiny, and has a good electrical and thermal conductivity

2.Steel, copper, zinc, aluminum, and stainless steel

3. Ferrous and non-Ferrous metals. The ferrous metal has a measure of iron in them but non-ferrous metals contain no iron at all.

4. Density, Colour/Lustre, Fusibility, Magnetic effect

5. Metals.

Week 8

Properties of Metal (cont'd)

Outline:

1. Classification of Metal
2. Forms of Metal

Classification of Metals –

Earth is an abundant source of materials. The air we breathe, the water we drink, stones and rocks, almost everything that is around us, are all useful to man for some purpose or the other. Gaseous materials like Oxygen, Nitrogen and Carbon dioxide are found in the atmosphere. Common salt and various other salts of sodium, magnesium and calcium are found dissolved in water bodies, like the oceans, rivers and lakes.

The progress of the civilization was first benchmarked by man's increasing knowledge and usage of metallic deposits in the earth's crust. Early man used stones, bones and wood to fulfill their requirements of hunting, cooking and building. The first metals to be found and used were copper, silver and gold as they could be easily extracted. By 2000 B.C. he acquired the knowledge of extracting iron from its ores by heating and this period came to be known as "Iron Age". Bronze was widely used for many years and this epoch of prehistory became "Bronze Age". As time went by, minerals were found to produce metals with different properties. These developments indicate a gradual change in the life style of mankind. Today metals are so vital to the modern man that it is unthinkable to live without them. They are essential for the construction of houses, transportation, communication, electricity, household articles, scientific instruments, coins etc. More than 75% of the known elements are metals.

There are about 103 elements, 92 of which are naturally occurring. Metals and non-metals are characterized by distinctly different physical and chemical properties. At present about 80 metals are known to us. Metals can be shaped like clay, are heat-resistant, and are not fragile.

Though the non-metals are only 22 in number, they are the major constituents of earth, air and oceans. At room temperature, over half of the non-metals are gases, except bromine, which is a liquid. The most abundant non-metal in the earth's crust is oxygen, which constitutes about 50% of the earth's crust and along with nitrogen it forms the main constituents of air. The next abundant nonmetal is silicon which constitutes about 26% of the earth's crust. Oxygen and silicon are the two major constituents of earth. Hydrogen and oxygen are the two major constituents of the oceans.

Metals can be divided into two main groups: ferrous metals are those which contain iron

and non-ferrous metals that are those which contain no iron.

Ferrous Metals

Pure Iron is of little use as an engineering material because it is too soft and ductile. When iron cools and changes from a liquid to a solid, most of the atoms in the metal pack, tightly together in orderly layers. Some, however become misaligned, creating areas of weaknesses called dislocations. When a piece of iron is put under stress, layers of atoms in these areas slip over one another and the metal deforms. This begins to explain the ductility of soft iron. By adding carbon to the iron however, we can produce a range of alloys with quite different properties. We call these the carbon steels. An alloy is a mixture of two or more chemical elements and the primary element is a metal.

Carbon Steels: their properties and uses

Mild Steel: carbon content between 0.1% and 0.3%. Properties: less ductile but harder and tougher than iron, grey colour, corrodes easily. Uses: girders or beams, screws, nut and bolts, nails, scaffolding, car bodies, storage units, oil drums.

Medium carbon steel contains between 0.3% and 0.7% carbon. Properties: harder and less ductile than mild steel, tough and have a high tensile strength. Uses: it's used for the manufacture of products which have to be tough and hard wearing like gears, tools, keys, etc

High carbon steel contains between 0.7% and 1.3% carbon. Properties: Very hard and brittle material. Uses: It's used for cutting tools and products which have to withstand wear such as guillotine, springs, etc.

Stainless steel are iron and chromium alloys. A wide range of steels are available with chromium content between 13% and 27%. Properties: Chromium prevents rusting with an oxide film. Ductility, hardness and tensile strength. It's also a shiny attractive metal. Uses: Cutlery, sinks, pipes, car pieces, etc.

Grey Cast Iron is an alloy of iron (94%), carbon (3%) silicon (2%) and some traces of magnesium, sulphur and phosphorous. Properties: brittle but extremely hard and resistant, it corrodes by rusting, Uses: pistons, machinery parts, streets lamps, drain covers, tools.

Other chemical elements can be added to steel, to improve or achieve certain properties. Here you are some examples:

1. Silicon makes the alloy magnetic and improves elasticity.
2. Manganese makes the alloy harder and heat-resistant. It's used to make stainless steel.
3. Nickel improves strength and prevents corrosion.

4. Tungsten makes the steel harder, more heat-resistant and prevents corrosion.
5. Chromium makes the alloy harder and tougher and more rustproof.

Non-ferrous metals

They are metals that don't contain iron. They have a lot of uses but they are often expensive because they are more difficult to extract.

Some metals are ferrous metals and others are non-ferrous metals. Ferrous metals have a measure of iron in them but non-ferrous metals contain no iron at all.

— Ferrous metal: Wrought iron, Cast iron, Steel

— Non-ferrous metal: Brass, Aluminium, Copper

Forms of Metal –

There are different types of metals based on physical and chemical properties. They are the hardest elements which are found on the earth.

Most of the metals are solids in nature except for mercury which shows liquid-like motion. They are bendable into different shapes and have many uses in human life.

They have special properties unlike other elements in the periodic table.

When oxidized they are alkaline in nature. They react with acids and even get rusted when exposed to air for a long time.

They are also present in minute quantities in living beings.

Based on properties, metals can be differentiated as:

Ferrous metal : Ex: iron, steel.

Non-ferrous metals: Ex; Aluminum, lead, copper.

Noble metals: Ex; Gold, platinum, silver.

Heavy metals: Ex: Arsenic, cadmium, lead.

Most metals are solid at room temperature, but this does not have to be the case. Metals come in different forms, they could be round, rectangular, tubular, flat, plates, strip, wires etc.

Metal Types

In physical form, metals can be defined as substances, which have a bright luster and are good conductors of heat and electricity. They have varying degrees of density, hardness, malleability and ductility. (Malleability concerns being able to be hammered and rolled

out, while ductility has to do with being drawn out, as into wire.).

Metals have a certain melting point and will fuse with other metals to form alloys. At normal room temperature, all the metals exist in solid form, with the only exception of mercury.

Available in a variety of forms, shapes and structures, the different forms of metal differ in their properties and appearance. These different forms come in virtually all types of metals and primarily in steel, copper, zinc, aluminum, or stainless steel. Copper and stainless steel are the most corrosion resistant and also the most expensive. With peculiar coating, such as zinc coating on galvanized steel, other types of metals can be made more durable.

Forms

Metals come in a variety of forms and shapes that differ in their appearance and properties. The different forms and shapes of metals have found to be suitable for different industrial uses and requirements. Some of the most common forms of metals are –

- Metal Sheet
- Metal Plate
- Metal Rod
- Metal Bar
- Metal Shot
- Metal Grain
- Metal Powder
- Clad Metal
- Bonded Metal

Some metals are found in the pure state, however, majority of them are found in combination with other elements. These metals are in the form of carbonates, sulphides, oxides, and silicates, generally mixed with rock and earthy materials. Some of the common metals that are found in combination in ores are zinc, iron, lead, copper, chromium, mercury and nickel.

Some metals are so rare that tons of ore must be treated to generate even a small amount of pure metal. Radium is one of these. The branch of science that deals with the recovery of metals from their ores is known as metallurgy.

Many metals, when in pure state, have properties, which are undesirable. Due to this, most of the metals commonly used today are either compounds or alloys. Some examples of alloys are gold coins, table silver, and aluminum pans. Pure iron is too soft to be of much value, so it is used most often as steel, which is a compound. There are a few metals that in tiny amounts, are essential to animal life. Among these are potassium, iron, magnesium, calcium, and sodium.

ASSESSMENT

One of these is not a gaseous materials found in the atmosphere

(a) Oxygen

(b) Silicon

(c) Nitrogen

(d) Carbon dioxide

These is not one of the metals found and used by early men

(a) diamond

(b) copper

(c) silver

(d) gold

The period when early man acquired the knowledge of extracting iron from its ores by heating is known as

(a) Diamond Age

(b) Bronze Age

(c) Iron Age

(d) Gold Age

There are about ____ elements

(a) 100

(b) 101

(b) 102

(d) 103

Non-metals are only ___ in number

(a) 30

(b) 22

(c) 45

(d) 16

ANSWERS

1. b
2. a
3. c
4. d
5. b

Weeks 9 & 10

Topic: Properties of Ceramics, Plastics and Rubber

Contents

A ceramic

A ceramic is an inorganic compound, nonmetallic, solid material comprising metal, nonmetal or metalloid atoms primarily held in ionic and covalent bonds. A lot of us today live in modern houses with modern facilities. Most of our grand-parents and great-grand-parents did not enjoy some of the recent tools and equipment we have access to and enjoying. Today, many kitchens and household containers are made from clay and cement. These include cooking pots, water pots, etc. Clay and mud are also used in some places to make houses. The items made clay and mud are called ceramics.

The earliest ceramics made by humans were pottery objects (i.e. pots or vessels) or figurines made from clay, either by itself or mixed with other materials like silica, hardened, sintered, in fire. Later ceramics were glazed and fired to create smooth, colored surfaces, decreasing porosity through the use of glassy, amorphous ceramic coatings on top of the crystalline ceramic substrates. Ceramics now include domestic, industrial and building products, as well as a wide range of ceramic art. In the 20th century, new ceramic materials were developed for use in advanced ceramic engineering, such as in semiconductors.

However, ceramics can break easily when they are dropped forcefully. This means they are brittle, and for this fact, they have to be handled with extreme care and caution. This makes ceramics different from plastic, wood, metal and rubber. Traditional ceramic raw

materials include clay minerals such as kaolinite, whereas more recent materials include aluminium oxide, more commonly known as alumina. The modern ceramic materials, which are classified as advanced ceramics, include silicon carbide and tungsten carbide. Both are valued for their abrasion resistance, and hence find use in applications such as the wear plates of crushing equipment in mining operations. Advanced ceramics are also used in the medicine, electrical, electronics industries and body armor.

Uses of Ceramics

Ceramics offer many advantages compared to other materials. They are harder and stiffer than steel; more heat and corrosion resistant than metals or polymers; less dense than most metals and their alloys; and their raw materials are both plentiful and inexpensive. Ceramic materials display a wide range of properties which facilitate their use in many different product areas.

Aerospace: space shuttle tiles, thermal barriers, high temperature glass windows, fuel cells

Consumer Uses: glassware, windows, pottery, Corning¨ ware, magnets, dinnerware, ceramic tiles, lenses, home electronics, microwave transducers

Automotive: catalytic converters, ceramic filters, airbag sensors, ceramic rotors, valves, spark plugs, pressure sensors, thermistors, vibration sensors, oxygen sensors, safety glass windshields, piston rings

Medical (Bioceramics): orthopedic joint replacement, prosthesis, dental restoration, bone implants

Military: structural components for ground, air and naval vehicles, missiles, sensors

Computers: insulators, resistors, superconductors, capacitors, ferroelectric components, microelectronic packaging

Other Industries: bricks, cement, membranes and filters, lab equipment

Communications: fiber optic/laser communications, TV and radio components, microphones

Plastics

Plastics are the byproduct gotten from the fractional distillation of crude oil, which are also materials used to mould household containers. Plastics can be made in different ways. It can be made as hard as stone, as strong as steel, as transparent as glass, as light as wood, and as elastic as rubber. Plastics are usually lightweight and come in different colors.

Plastic is material consisting of any of a wide range of synthetic or semisynthetic organic compounds that are malleable and so can be molded into solid objects.

Plasticity is the general property of all materials which can deform irreversibly without breaking but, in the class of moldable polymers, this occurs to such a degree that their actual name derives from this ability.

Plastics are typically organic polymers of high molecular mass, but they often contain other substances. They are usually synthetic, most commonly derived from petrochemicals, but many are made from renewable materials such as polylactic acid from corn or cellulosics from cotton linters.

Due to their relatively low cost, ease of manufacture, versatility, and imperviousness to water, plastics are used in an enormous and expanding range of products, from paper clips to spaceships. They have already displaced many traditional materials, such as wood, stone, horn and bone, leather, paper, metal, glass, and ceramic, in most of their former uses.

Types of plastics

There are two types of plastics – thermoplastics and thermosets.

Thermoplastics: These are the plastics that become soft and flow like a thick liquid when they are heated, they can therefore be remoulded. Most of the plastic containers that we use at home are in this group. Thermoplastics are the plastics that, when heated, do not undergo chemical change in their composition and so can be molded again and

again. Examples include: polyethylene (PE), polypropylene (PP), polystyrene (PS) and polyvinyl chloride (PVC). Common thermoplastics range from 20,000 to 500,000 amu, while thermosets are assumed to have infinite molecular weight.

Thermosets: They are the plastics that we cannot soften to liquid by heating. Examples are the buttons on our shirts and plastic handles of cooking pots and knives. Thermosets, or thermosetting polymers, can melt and take shape only once: after they have solidified, they stay solid. In the thermosetting process, a chemical reaction occurs that is irreversible. The vulcanization of rubber is an example of a thermosetting process: before heating with sulfur, the polyisoprene is a tacky, slightly runny material; after vulcanization, the product is rigid and non-tacky. Plastics have advantages and disadvantages.

S/N	ADVANTAGES OF PLASTICS	DISADVANTAGES OF PLASTICS
1.	They are lightweight.	Some plastics produce poisonous flame when burnt.
2.	They can be moulded into different shapes and sizes.	They litter the surroundings.
3.	They are relatively inexpensive to produce.	

Uses of Plastics

The relatively low density of most plastic materials means the end products are lightweight. They also have excellent thermal and electrical insulation properties. However, some can even be made as conductors of electricity when required. They are corrosion resistant to many substances which attack other materials, and some are transparent, making optical devices possible. They are also easy to mould into complex shapes and forms, allowing integration of different materials and functions. And in the event that the physical properties of a given plastic do not quite meet the specified requirements, the property balance can be modified with the addition of reinforcing fillers, colours, foaming agents, flame retardants, plasticisers etc., to meet the demands of the specific application.

For these reasons and more, plastics are increasingly used in:

uses..


Packaging


Building and Construction


Transportation


Medical & Health


Electrical & Electronic


Agriculture


Sport & Leisure

Rubber

Natural rubber also called India rubber consist of some chemicals called polymers of the organic compound isoprene, with minor impurities of other organic compound. This means that rubber is a nonmetal product which looks like plastic though, but it is more elastic than plastic. It can be stretched easily and it returns to its original length when it is released after being stretched and does not allow water to pass through it.

Types of rubber

There are two types of rubber. Rubber can be natural or synthetic.

Natural rubber comes from milky liquid called latex which is extracted from the rubber tree. Natural rubber, also called India rubber or caoutchouc, as initially produced, consists of polymers of the organic compound isoprene, with minor impurities of other organic compounds, plus water. Malaysia and Indonesia are two of the leading rubber producers.

Synthetic rubber is produced from organic materials derived from petroleum. A synthetic rubber is any artificial elastomer. These are mainly polymers synthesized from petroleum byproducts. About 15 billion kilograms (5.3×1011 oz) of rubbers are produced annually, and of that amount two thirds are synthetic. Global revenues generated with synthetic rubbers are likely to rise to approximately US$56 billion in 2020. Synthetic rubber, like natural rubber, has uses in the automotive industry for tires, door and window profiles, hoses, belts, matting, and flooring.

Natural rubber VS. Synthetic rubber

Natural rubber, coming from latex of Hevea brasiliensis, is mainly poly-cis-isoprene containing traces of impurities like protein, dirt etc. Although it exhibits many excellent properties in terms of mechanical performance, natural rubber is often inferior to certain synthetic rubbers, especially with respect to its thermal stability and its compatibility with petroleum products.

Synthetic rubber, like other polymers, is made from various petroleum-based monomers. The most prevalent synthetic rubbers are styrene-butadiene rubbers (SBR) derived from the copolymerization of styrene and 1,3-butadiene. Other synthetic rubbers are prepared from isoprene (2-methyl-1,3-butadiene), chloroprene (2-chloro-1,3-butadiene), and isobutylene (methylpropene) with a small percentage of isoprene for cross-linking. These and other monomers can be mixed in various proportions to be copolymerized to produce products with a range of physical, mechanical, and chemical properties. The monomers can be produced pure and the addition of impurities or additives can be controlled by design to give optimal properties. Polymerization of pure monomers can be better controlled to give a desired proportion of cis and trans double bonds.

Uses of Rubber

Most rubber is used for tyres for cars, large vehicles and planes. Rubber is also used to make many mechanical parts such as gaskets, belts and seals.

Rubber products include waterproof clothing, gloves, hats, shoes and household products. Medical equipment made of rubber includes hot water bottles, gloves, syringes, tapes, oxygen tents, hearing aids and many more. Swimmers wear goggles,caps and flippers made of rubber. Many sports have rubber equipment, such as golf balls and other rubber balls. Rubber products seal jars, are used in toys and paints and for recreation. Sponge and foam rubbers are used to make bedding and other furniture, cushions and pillows, and as insulation.

Exercise:

1. State the common characteristics of ceramics
2. State the two different types of plastics
3. Describe the properties of the two types of plastics
4. List some of the characteristics of rubber
5. What is the difference between synthetic and natural rubber

Answer

1. Common characteristics of ceramics is that they are brittle therefore can break

easily if dropped to the ground

2. Two types of plastics include: Thermoplastics and Thermosets
3. Thermoplastics are plastics that become soft and flow like a thick liquid when they are heated; they can then be remoulded. While Thermosets are the plastics that we cannot soften to liquid by heating.
4. Rubber is a non-metal product. It looks like plastic but it is more elastic than plastic. Rubber does not allow water to pass through it
5. Synthetic rubber is produced from organic materials derived from petroleum while Natural rubber comes from the milky liquid called latex.

JSS 1

BASIC TECHNOLOGY

SECOND TERM

week1

Topic: Drawing Instruments & Materials (I)

Outline:

- Types of Instruments and Materials for Technical Drawing
- Uses of Drawing Instruments & Materials

Introduction:

Technical drawing is a universal language used for communication among technical people.

These are engineers, technicians, designers, builders, etc. It is a language expressed in terms of graphic illustrations which convey the idea of shape, size and other features of engineering components used in the manufacturing and construction industries.

We study drawing so that we can draw objects for other people to see and understand what we have in mind without talking to us or asking questions. It is therefore important that we learn the language of drawing. To do this, we start with the descriptions of instruments and materials that are used, and later we learn how to use them to produce drawings and how to take good care of them.

Types of Instruments and Materials for Technical Drawing

A good and accurate drawing can only be made through constant practice with the aid of drawing instruments and materials. Below is a list of instruments and materials for technical drawing.

- Drawing board
- Tee-square
- Set-squares (300 x 600 and 450)
- Protractor
- Compasses
- Dividers
- Drawing paper clips
- Scale rules
- Metric rules

- French curve
- Template
- Lettering set
- Sharpener
- Drawing pencils
- Drawing paper
- Adhesive
- Erase
- Emery cloth
- Glass paper

Uses of Instruments and Materials for Technical Drawing

1. The drawing board is the wooden platform on which the drawing paper is placed before the drawing commences The two main types are discussed below:

— Full imperial size: This is 812 x 585mm (millimetres) in size. These types are usually left at the studio by the draughtsman. It has a tee-square (or already parallel bar to it) which can slide from the top of the table to bottom; the board can also be inclined to the desired position

— Half imperial (585 x 452mm) size: This is the most useful it portable and ideal for the much simpler work that students will be involved in. Ideal drawing bards are made of medium-hard, ever-grained hardwood or fine-grained plywood (12-18mm thick) both with slotted battens on the underside to keep it flat.

2. Tee-square is used for drawing horizontal lines and it also supports set –squares during drawings. The ideal tee-square is the one that is the same size as with the drawing board. The tee-square is placed on the drawing board with the stock at the left hand edge of the board. A suitable tee-square is made of mahogany with the square edge lined with a hard wearing wood such as ebony for durability.

Tee-square can also be made of an opaque plastic stock and a transparent plastic blade.

3. Drawing Pencils: Drawing pencils are of different grades. There are two types of pencil:

- Soft pencils: These are soft and black. These include grade pencils.
- Hard pencils. These include H grade pencils, such as H, 2H, 3H, 4H to 8H pencils.

Uses of Pencils in Technical Drawings

- For general drawing: 3H or 2H grade pencils are ideal
- For lettering or freehand sketching: Use H or HB-grade pencils sharpened to a 'conical point'.

For technical or engineering drawing: Use 2H or 3H grade pencils sharpened to a 'chisel point'

A piece of fine emery cloth or No. O glass paper or a pencil sharpener would be necessary to keep the points sharp for working to fine limits. Also, we have a thin lead mechanical pencil (refill) which requires no pencil sharpening. It is also available in different grades.

4. Set of Drawing Instruments: There are various brands of sets of drawing instruments. A complete set should contain the following:

A compass: used for drawing circles and arcs

A divider: used for transferring the measurement from the metric rule to the drawing.

Ink lining pen attachment for a compass.

An election compass is ideal, with needle points and adjustment devices, knee joints, and extension bars.

5. Set-Squares: Set-squares are used to draw vertical or diagonal lines. They can also be paired up for specific angle drawing. Set-square plays an important role in technical, engineering or geometrical drawing. Acrylic (plastics) set-squares are of great value, and highly satisfactory with careful use as the bevel edges are helpful for inking in. Teachers can make use of wooden ones on the chalkboard.

6. Drawing Paper Clips or Adhesive Tapes: Drawing papers are best held on the boards with the aid of clips or adhesive tape. The use of pins or cello-tape should be discouraged because it also causes the distortion of centre lines while cello tapes deface the finishing on the paper.

7. Protractor: The protractor is used for measuring and marking out angles. An ideal protractor is made of acrylic materials with divisions ranging from half a degree through 900 to 1800.

8. Scale Rules: Scales rules are used to produce reduced or enlarged sizes of objects. They are usually triangular in shape and have three edges. Generally, each edge of the scale rule is graduated, and each scale designation is marked on the rule. The use of a scale rule is vital, as most linear sizes are not possible on paper. Therefore, with a scale rule, we can enlarge or reduce the size of an object on paper. A metric rule is used for measuring straight lines. It is usually made of steel, wood or plastic. It has two straight edges graduated in

centimetres, millimetres and inches. A typical ruler is 30cm long.

9. French Curves: French curves are used for drawing various types of curves. Ideal French curves are made of acrylic material in which possible curvatures are incorporated. Another type consists of a flexible bar which can be physically bent to suit various curves (known as flex curve).

10. Drawing Paper: This is the paper on which the drawing is produced. Creamy white paper is ideal for drawing. The sizes vary in relation to the size of the drawing board usually from quarter to full imperial. Suitable metric sizes are A2, A3 and A4. Drawing paper sizes are listed below:

A0 = 841mm x 1189mm

A1 = 594mm x 841mm

A2 = 420mm x 594mm

A3 = 297mm x 420mm

A4 = 210mm x 297mm

Other Drawing Papers – In addition to the normal creamy-white drawing paper, there are:

(a) Tracing paper and (b) transport cloth-baked drawing paper.

1. Tracing paper: This is a transparent paper used for original drawing which is later printed on normal drawing paper. Tracing papers are reference papers for original copies.

2. Transparent cloth-baked drawing paper: This is used almost the same way as the tracing. Valuable documents are usually drawn on cloth-baked papers and they are 'originals' as against copies for which normal tracing papers are intended. This type of paper is usually used by surveyors.

ASSESSMENT

1. List 5 materials for Technical drawing

2. What are protractors used for

3. What is a divider?

ANSWER

1. (i) Drawing board (ii) Tee-square (iii) Set-squares (300 x 600 and 450) (iv) Protractor (v) Compasses

2. The protractor is used for measuring and marking out angles

3. The divider is used for transferring the measurement from the metric rule to the drawing

week2

Drawing Instruments and materials (I)

Course Outline:

Types of drawing Instruments

Uses of drawing materials

Introduction:

Technical drawing is a universal language used for communication among technical people these technical people are engineers, technicians, designers, builders, etc. It is a language expressed in terms of graphic illustrations which convey the idea of shape, size and other features of engineering components used in the manufacturing and construction industries.

We study drawing so that we can draw objects for other people to see and understand what we have in mind without talking to us or asking questions. It is therefore important that we learn the language of drawing. To do this, we start with the descriptions of instruments and materials that are used, and later we learn how to use them to produce drawings and how to take good care of them.

Types of Drawing Instruments and Materials for Technical Drawing:

A good and accurate drawing can only be made through constant practice with the aid of drawing instruments and materials. Below is a list of instruments and materials for technical drawing.

Drawing, Tee-square, Set-squares (300 x 600 and 450), Protractor, Compasses, Dividers, Drawing paper clips, Scale rules, Metric rules, French curve, Template, Lettering set, Sharpener, Drawing pencils, Drawing paper, Adhesive, Erase, Emery cloth, Glass paper.

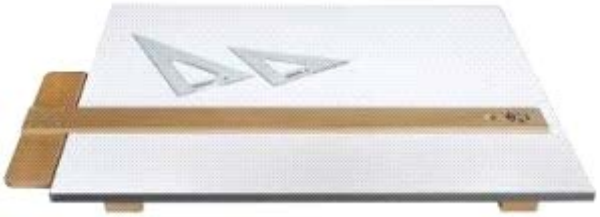
Uses of drawing materials:

Drawing board –

The drawing board is the wooden platform on which the drawing paper is placed before the drawing commences. The two main types of drawing boards are:

Full imperial size: This is 812 x 585mm (millimeters) in size. These types are usually left at the studio by the draughtsman. It has a tee-square (or already parallel bar to it) which can slide from the top of the table to bottom; the board can also be inclined to the desired position.

Half imperial size: This is 585 x 452mm size, it is the most useful, portable and ideal for the much simpler work that students will be involved in. Ideal drawing boards are made of medium-hard, ever-grained hard wood or fine-grained plywood (12-18mm thick) both with slotted battens on the underside to keep it flat.



Tee-Square –

Tee-square is used for drawing horizontal lines and it also supports set –squares during drawings. The ideal tee-square is the one that is the same size as with the drawing board. The tee-square is placed on the drawing board with the stock at the left hand edge of the board. A suitable tee-square is made of mahogany with the square edge lined with a hard wearing wood such as ebony for durability.

Tee-square can also be made of an opaque plastic stock and a transparent plastic blade.

Drawing Pencils –

Drawing pencils are of different grades. There are two types of pencil:

1. Soft pencils: These are soft and black, they include grade pencils as well.
2. Hard Pencils: These include H grade pencils, such as H, 2H, 3H, 4H to 8H pencils.

Uses of Pencils in Technical Drawings

1. For general drawing: 3H or 2H grade pencils are ideal
2. For lettering or freehand sketching: Use H or HB-grade pencils sharpened to a 'conical point'.
3. For technical or engineering drawing: Use 2H or 3H grade pencils sharpened to a 'chisel point'.
4. A piece of fine emery cloth or No. O glass paper or a pencil sharpener would be necessary to keep the points sharp for working to fine limits.
5. Also, we have thin lead mechanical pencil (refill) which requires no pencil sharpening. It is also available in different grades.

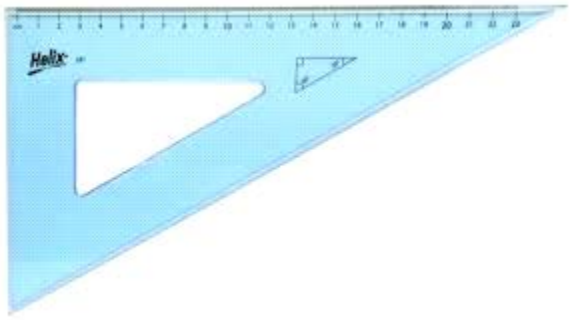
Set of Drawing Instruments–

There are various brands of sets of drawing instruments. A complete set should contain the following:

- **A compass:** used for drawing circles and arcs
- **A divider:** used for transferring the measurement from the metric rule to the drawing.
- **Ink lining** pen attachment for compass.
- **An election compass** is ideal, with needle points and adjustment devices, knee joints, and extension bars.

Set-Squares –

Set-squares are used to draw vertical or diagonal lines. They can also be paired up for specific angle drawing. Set-square plays an important role in technical, engineering or geometrical drawing. Acrylic (plastics) set-squares are of great value, and highly satisfactory with careful use as the bevel edges are helpful for inking in. Teachers can make of wooden ones on the chalkboard.

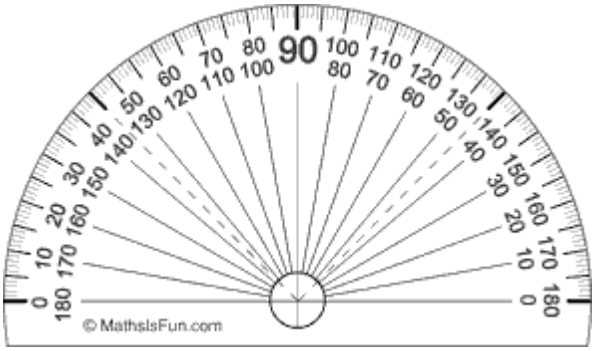


Drawing Paper Clips or Adhesive Tapes –

Drawing papers are best held on the boards with the aid of clips or adhesive tape. The use of pins or cello-tape should be discouraged because it also causes the distortion of centre lines while cello tapes deface the finishing on the paper.

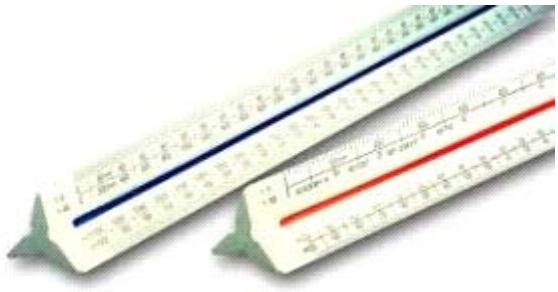
Protractor –

The protractor is used for measuring and marking out angles. An ideal protractor is made of acrylic materials with divisions ranging from half a degree through 900 to 1800.



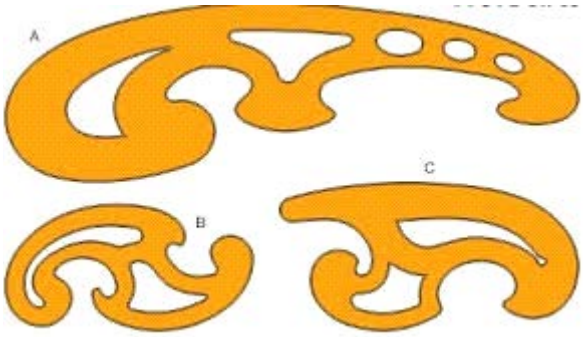
Scale Rules –

Scales rules are used to produce reduced or enlarged sizes of objects. They are usually triangular in shape and have three edges. Generally, each edge of the scale rule is graduated, and each scale designation is marked on the rule. The use of a scale rule is vital, as most linear sizes are not possible on paper. Therefore, with a scale rule, we can enlarge or reduce the size of an object on paper. A metric rule is used for measuring straight lines. It is usually made of steel, wood or plastic. It has two straight edges graduated in centimeters, millimeters, and inches. A typical ruler is 30cm long.



French Curves –

French curves are used for drawing various types of curves. Ideal French curves are made of acrylic material in which possible curvatures are incorporated. Another type consists of a flexible bar which can be physically bent to suit various curves (known as flex curve).



Drawing Paper –

This is the paper on which the drawing is produced, creamy white paper is ideal for drawing. The sizes vary in relation to the size of the drawing board usually from quarter to full imperial. Suitable metric sizes are A2, A3, and A4.

Drawing paper sizes are listed below:

AO = 841mm x 1189mm

A1 = 594mm x 841mm

A2 = 420mm x 594mm

A3 = 297mm x 420mm

A4 = 210mm x 297mm

Other Drawing Papers

In addition to the normal creamy-white drawing paper, there are:

(a) Tracing paper and (b) Transport cloth-baked drawing paper.

Tracing paper: This is a transparent paper used for original drawing which are later printed on normal drawing paper. Tracing papers are reference papers for original copies.

Transparent cloth-baked drawing paper: This is used almost the same way as the tracing. Valuable documents are usually drawn on cloth-baked papers and they are 'originals' as against copies for which normal tracing papers are intended. This type of paper is usually used by surveyors.

Eraser –

There are various types of erasers and they are generally called rubbers. A good eraser must erase cleanly without picking or tearing the surface of the paper.

Templates –

These are available in various shapes, such as geometrical shapes (e.g. squares, circles, polygons, quadrilaterals, etc.) or shapes of architectural designs (e.g. floor plan, plumbing, furniture, landscape, etc.) or letters and alphabets.

Lettering Instruments –

These are instruments used by the draughtsman or the designer to draw various types of letters and alphabets. These include lettering machine, latter guide, template, pen, scriber, etc.

Exercises:

1. List 10 instruments for technical drawing
2. Mention the types of drawing boards available
3. What degrees of Set-Squares are available?
4. What grade of pencil do you use for general drawing?
5. Drawing paper sizes ranges from what to what?

Answers:

1. Drawing paper clips, Scale rules, Metric rules, French curve, Template, Lettering set, Sharpener, Drawing pencils, Drawing paper, Adhesive.
2. A draughtsman's and a student's drawing board
3. 3, they are: 30, 45 and 60 degrees
4. 3H or 2H grade pencil
5. From A0 to A4

Week 3

Care of Drawing Instruments

Introduction:

Just as we need to take of ourselves, our clothing, houses and other property, so also do our drawing instruments need good care in order to prolong their service life and for safety reasons. Therefore, these precautions should be observed in respect of the following instruments:

Drawing board:

- Do not use pins for fastening your paper to the board, use tapes or clips
- Do not use blade or knife to cut something on the surface of your drawing board.
- Always cover the surface with cardboard or thick paper.
- Keep the drawing board in a safe place when not in use.

Tee-square:

- Never use the tee-square as a walking stick or as a cane.
- Do not use pen knife or blade along the edge of the tee-square.
- Always hang your tee-square when not in use.
- Always keep your tee-square clean

Set-square, Scale Rules, Protractor, and French Curves:

- Do not use any sharp object such as razor blade or knife on their edges
- Keep them away from fire
- Always keep them in a safe place immediately after us to prevent breakage.

Pair of Compasses or Dividers:

- Do not sit or step on compasses
- When not in use, keep them away in a safe container.
- Never use compasses or dividers as paper holders.

- Do not use their needle points to punch holes.

Other Instruments

- All other instruments should be kept in their packets after use.
- A cupboard should be made available for complete storage of the drawing boards and all other instruments.

Exercises:

Mention the ways by which you take care of your drawing board

Answers:

- Care for drawing board include:
- Do not use pins for fastening your paper to the board, use tapes or clips
- Do not use blade or knife to cut something on the surface of your drawing board.
- Always cover the surface with cardboard or thick paper.
- Keep the drawing board in a safe place when not in use.

Week 4

Topic: Types of buildings

Outline:

- Types of building
- Types of building materials

Types of Building:

Building types could also be identified by their construction design i.e. outlines and method of the arrangement of the walls and the height of the building. They are bungalows, duplex, detached, semi-detached, huts, high rise and skyscrapers.

1. Hut

This is a small unit of ancient design built with mud, usually round in a shape and usually covered with thatch. A conglomeration of these usually forms a village with one of them being fairly larger, rectangular or square shape which is occupied by the village head. Largely due to their unique and beautiful round shape, huts find their ways at strategic positions in modern hotels, such as suya spots, etc. Although still covered with thatch, they are constructed with other additional materials like timber and even metals.

2. Bungalows

These are buildings that only occupies the ground floor. A flat design can accommodate a single family unit and a multi-room design can accommodate more than one family unit.

3. Duplex

This is a compact storey building usually roofed at the first floor and only designed to accommodate a single family unit. The general design is to locate the sitting room, dining room, the kitchen and the guest room with their conveniences at the ground floor while the bedrooms and at times a private sitting room and their conveniences are located at the first floor.

4. Detached Buildings

These are built and designed to occupy a single plot of land. These are in most cases residential apartment. They could be in the form of bungalows or duplexes.

5. Semi-detached Buildings

These are two or more housing units built with a common wall boundary to mark the extent of each building on a plot of land. This could be a bungalow or a duplex design.

6. High-rise Buildings

These are fairly tall buildings of modern design with all the modern amenities like water supply and electricity. In European countries, where they are very common, they also have other infrastructures like gas and telephone lines. In most cases, they are designed for residential purposes.

7. Skyscrapers

They are tall buildings of at least forty-five storeys. These are public buildings, designed purely as offices and for government activities. They are wonderfully designed to provide all the required infrastructures and amenities.

Types of building & materials:

Buildings are identified by the types of materials with which they are erected

1. Mud Buildings –

These are erected with loamy/clayey soil which has been properly treated to plastic nature. They produce very thick walls. Most mud buildings do not exceed ground floor level. However, building research has recently proved that they could also be taken up to the first floor level.

2. Brick Buildings –

Bricks are moulded from dried mortar (a mixture of cement, sand and lime) and at times clay. They are dried and at times burnt in kiln. Bricks are of two types:

- The sun dried bricks
- The fire dried bricks (red bricks)

3. Sandcrete Buildings –

Sandcrete blocks are made from the mixture of cement and sand. The blocks are used to erect buildings. They have standardized size e.g. 225mm X 225mm X 675mm. The cement and sand mixture is poured into fabricated metal moulds by mechanical vibration and compaction or by manual compaction. They are formed into blocks of sizes of the metal moulds.

4. Wood Buildings –

They are erected with logs, timber or plywood.

Importance of Buildings(to be continued)

Exercise:

1. List 5 types of buildings based on their construction design
2. List 3 types of buildings based on the types of materials with which they are erected
3. What is the difference between detached and semi-detached buildings
4. How many types of bricks exist, mention them
5. What is the lowest number of storey a skyscraper can be built up to

Answer:

1. Hut, Bungalow, Duplex, Detached, Semi-detached
2. Mud, Sandcrete, Wood
3. Detached buildings are singular unit of house on a plot of land while Semi-detached are units of building separated by fence, on a parcel of land
4. There are two (2) and they are: Sun-dried and fire-dried bricks
5. Forty-five (45) storey's

Week 5

Topic: Building Materials (contd) – Uses

Outline:

1. Importance of Buildings
2. Uses of Building Material

Importance of Buildings

1. They offer protection against harsh weather e.g. sun, rain, heat/cold and fierce wind
2. They provide a safe place where we can lodge our valuables
3. They provide a medium where official engagements can be carried out
4. They provide a place to house agricultural products like animals and crop yields
5. They provide a medium for residential, commercial and industrial activities

Uses of Building Materials

These are some common building materials and their uses:

1. Sand – this is the commonest building material. There are two types of sand are used in building construction and these are:

- Soft sand
- Sharp sand

The two must be devoid of chemicals or minerals which could render them useless for building construction. Minerals and chemicals reduce the strength of sand mixture and cause them to fail when loaded.

2. Gravel – this is a constituent of concrete which is used in building construction. Gravel is derived from the weathering and erosion rocks. There are two main types of gravel, they are:

- Pebbles: These are small stones excavated from pits or river banks
- Granite chippings: These are small chippings of blasted granite stones generally collected in graded sizes

3. Cement – this is a finely powdered, manufactured substance consisting of gypsum plaster or portland cement, that hardens after being mixed with water. It is an essential material in building construction.

4. Wood – Wood is a natural product that forms the trunk of trees which is used as a material for building construction. They are used to produce wooden doors and windows and aso used as roof and ceiling structures

5. They are not commonly used nowadays but were good roof covering materials in the past

6. Glass – A factory produced building material fairly hard in texture but breaks easily. It is transparent and mostly used on windows and doors.

7. Plastics and Ceramics –

These are also factory produced and are generally used as sewage pipes for draining waste.

ASSESSMENT

1. Give four (4) importance of a building
2. Give four (4) example of a building material
3. Explain gravel and the types
4. What are plastics and ceramics used for in building

ANSWER

1.

They offer protection against harsh weather e.g. sun, rain, heat/cold and fierce wind

They provide a safe place where we can lodge our valuables

They provide a medium where official engagements can be carried out

They provide a place to house agricultural products like animals and crop yields

2.

Sand, Gravel, Cement, Glass

3.

Gravel – this is a constituent of concrete which is used in building construction. Gravel is derived from the weathering and erosion rocks. There are two main types of gravel, they are:

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JSS 1

BASIC TECHNOLOGY

THIRD TERM

TABLE OF CONTENT

Week 1

Revision of 2nd Term Work

Week 2

Woodwork hand-tools

BORING TOOLS –

In machining, boring is the process of enlarging a hole that has already been drilled (or cast), by means of a single-point cutting tool (or of a boring head containing several such tools). Boring is used to achieve greater accuracy of the diameter of a hole, and can be used to cut a tapered hole. Boring can be viewed as the internal-diameter counterpart to turning, which cuts external diameters.

Boring tools are used to make holes in wooden materials. The wooden material is held firm with braces before the boring is done. Some examples of boring tools are wood brace, ratchet brace, bradawl, etc; some of the boring tools are discussed below.

(I.) The Ratchet Brace:

The Ratchet brace has four (4) parts which are:

The Head: The head is made of hardwood and shaped to fit the hand of the user. It is screwed to a steel sleeve. It fits over the crank rod and runs on the hardened steel balls.

The Crank: This is a rectangular bent metal rod. It fits into the hardwood or plastic handle.

The Chuck: The end of the crank is enlarged, threaded and slotted to receive the socket and jaws respectively.

The Ratchet: A ratchet is a tool fitted to the ratchet brace so that holes can be drilled (bored) at specific parts that are not really exposed, such as corners where it is impossible to make complete turn.

CUTTING TOOLS –

In the context of machining, a **cutting tool** or **cutter** is any tool that is used to remove

material from the workpiece by means of shear deformation. Cutting may be accomplished by single-point or multipoint tools. Cutting and paring of woods are regular operation in the woodwork workshop. Saws and planes are used in cutting and smoothing wood in the workshop.

Examples of cutting tools and paring tools are rip saw, cross-cut saw, tenon saw, bow saw, dovetail saw, jack plane, smoothing plane, spokeshave, chisels, etc.

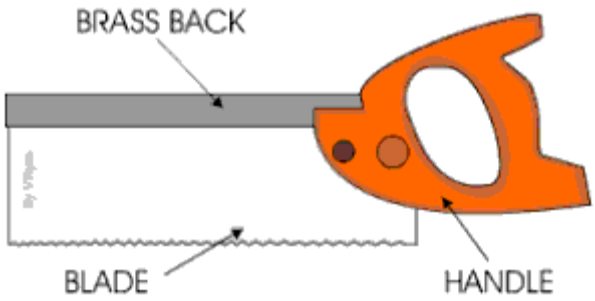
Saws – Saws are tools used for paring and cutting wood. There are two main groups of saw i.e. bench saw (hand saws) and curved saws.

Bench Hand Saws:

— Rip saw is about 750mm long and it used to cut large pieces of timber into small sizes, it is used to cut along the grain of wood.

— Cross-cut saw is used for cutting across i.e. at right angles to the grain. It has smaller teeth compared to the rip saw and the length is between 350mm and 700mm. Each tooth is set to alternate with the preceding one.

— Tenon saw is similar to the cross cut saw but shorter with a length ranging from 200mm to 400mm. it is used for cutting shoulders to tenon and recesses in board.



— Dovetail saw is also similar to tenon saw but is much shorter. Its length ranges from 150mm to 250mm; it is used for cutting fine joints and also light sawing, it usually has an open handle.

— Light backsaw has a thin small blade strengthened by a back. It is about 100mm to 200mm long and has only a plane round handle, used where extremely fine work is required such as dovetail for cutting of small moulding, etc.

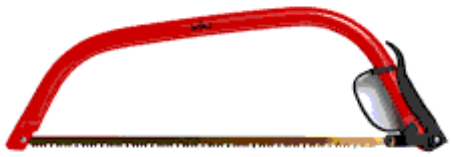
— Panel saw has pointed knife-like teeth similar to the cross-cut saw, but smaller. It is 450mm to 500mm long and used for sawing thin timber across 80 e.g. panels.

Curve-cutting Saws –

— Coping saw is used for cutting cured marked lines on wood. The blade can be adjusted to cut in any direction. The wood must be 15mm thick.

— Fret saw is used to cut curves in thin wood of 8mm thick or less. It is used to cut plywood.

— Bow saw is also used to along curved marked lines but the wood has to be 50mm thick. The frames of the saw are in different sizes such as 200mm, 300mm, 350mm etc.



— Compass saw has a narrow tapering blade of 350mm to 450mm long. It has an open handle. The teeth are adapted for cross cutting. It is used for cutting large interior and exterior curves.

Keyhole (pad) saw has a narrower blade than a compass saw. The blade is 6mm near the handle and 3mm at the tip. The length is 250-350mm and it has a round handle. It is used mainly for internal curves where the bow saw cannot be used.

— Nest of saws consist of three serrated blades and a detachable open handle. The blades are pruning blade, compass blade and keyhole blade.

ASSESSMENT

1. What is a boring tool?
2. Give two examples of boring tools

3. The Ratchet brace has four (4) parts which are?
4. ..... and ..... are used in cutting and smoothing wood in the workshop?
5. There are two main groups of saw, they are?

Answers:

1. Boring tools are used to make holes in wooden materials
2. 2 examples of boring tools are wood brace, ratchet brace
3. Head, Crank, Chuck, Ratchet
4. Saws and planes
5. Bench saw and Curved saw

Week 3

Woodwork Hand-tools (cont'd.)

Driving and Impelling tools –

Driving tools include a variety of steel tools used to install, repair and maintain a variety of constructions. Drivers are used to drill, insert and drive screws, nuts and bolts into surfaces with mechanical and manual force. Tools defined as drivers include hammers, screwdrivers, mauls and sledges. Driving tools are used to fix nails and screws into wooden and metal materials. Nails are the iron material with the flat head and a stem with a sharp end. The stem is usually smooth. Screws look like nails but they have turned (twisted) stem. Screws are driven into wood with screw drivers while nails are driven into wood and metals with the use of hammers.

NAILS

SCREWS

Hammers:

Hammers are driving tools that have two parts – a head which is made of iron and a handle, which is usually wooden. There are five types of hammers and their names are gotten from the type of head they have. These five are:

1. Ball Peen hammer

2. Straight Peen hammer

3. Cross Peen hammer

4. Planishing hammer

5. Blocking head hammer

Uses of Hammer

1. Straight peen hammer is also used for riveting in an awkward position. The other end is used for shaping sheet metals.
2. Ball peen hammer is used for general purposes. The ball peen section is used for riveting.
3. Blocking head hammer has polished faces. It is used for shaping sheet metals.
4. Cross peen hammer is used for drawing down and for riveting in an awkward position.
5. Planishing hammer is generally used by panel beaters. It has a flat face and a convex face. It is used for finishing because the faces are well polished.

Holding Devices:

It is necessary that there should be a means of holding wood and metals firmly on a workbench or on a machine tool in order to have a successful operation on them. Examples of some holding devices are bench hook, bench vice, G-Clamp, sash clamp etc. The work holding devices to be considered here include vices and clamps.

Vices –

1. Bench Vice: Bench vice is used to hold wood and metal for filing, sawing, chiseling and tapping. They are fitted into the edge of the workbench by bolts and nuts. They have serrated jaws for proper gripping, the jaw is tightened by rotating the bar.
2. Hand Vice: The hand vice is not fixed to anything as the bench vice, it is held by the hand. The work piece is put in between the two arms of the vice and it is tightened by means of screw.
3. Machine Vice: The machine vice looks like a bench vice, it is however not fixed on the machine tool bed. It can be rotated for machining at any desired angle.

Cramps/Clamps –

1. Pliers: Pliers are work holding devices held in the hand of users. It is used for gripping and cutting wire and thin metal sheets. Pliers come in different forms, their forms give them their different names mentioned below:

- Long nose pliers
- Cutting pliers
- Gripping pliers
- Combination pliers

The handle of pliers used by electrician is insulated with rubber to prevent electric shock.

2. Corner Clamp (Metre Clamp): This is used to hold work piece at right angle while gluing and pinning.

3. Sash Cramp: This is a large clamp used for holding and drawing parts of a work piece together while gluing. It is also called T-Cramp.

4. ‘G’ Cramp: This is a metal clamp used for holding a workpiece while sawing or chiseling.

5. Bench Holdfast: This is also used to hold job firmly on the bench when moulding or rebating.

6. Bench Hook: This is another device used to hold job to the bench while sawing or chiseling. It is also used to protect the bench.

Questions:

1. List two types of curve cutting saws
2. List two examples of bench planes
3. Bench vice looks like
4. Mention four types of cramp
5. What is a bench hook used for?

Answers:

1. Coping saw and Fret saw
2. Bench hook and Bench vice
3. Hand vice
4. Corner cramp, Sash cramp, G-cramp, Pliers
5. Bench Hook: This is another device used to hold job to the bench while sawing or chiseling. It is also used to protect the bench

Week 4

METALWORK HAND-TOOLS:

Content

- Introduction
- Measuring tools
- Marking out tools
- Holding devices

INTRODUCTION:

Metals are types of materials used in the workshop to produce various objects. Metals can be classified as “Ferrous” when they contain iron, or “”non-ferrous” when they do not contain iron. Certain tools are used in the workshop to manipulate these metal materials to use them to form different objects. Some of the tools are used in marking, some used in measuring, some used in driving, while others are used in cutting the metals.

MEASURING TOOLS:

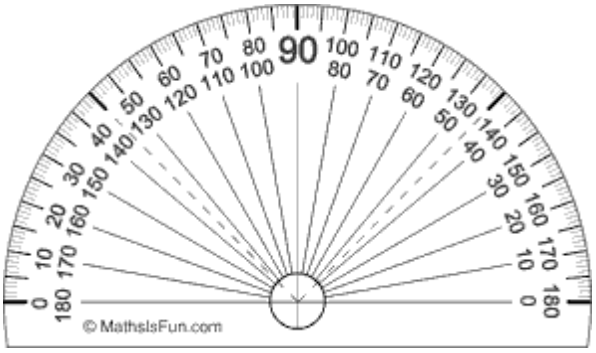
A measuring tool is a device used for measuring a physical quantity. Some of the existing tools are:

Steel Rule (Engineer’s Rule)

The steel rule is also called engineer’s ruler. It is made of carbon steel or stainless steel. The size commonly used is the 300mm and 150mm lengths. The steel ruler works with dividers and the calipers. The steel ruler is also used along with the calipers; after the calipers have been used to take a measurement, the measurement taken is translated into millimetres on the steel ruler.

Protractors

It is an instrument for measuring angles in metal work. The try square can be used for checking a 900 or a right angle only, but the protractor can be used for checking any angle.



<u>MARKING OUT TOOLS:</u>

Before metals can be measured and cut, they should be marked. The tools used to mark the sheet metals are called marking out tools. They include surface plate, scriber, odd-leg, calipers, etc.

The Surface Plate:

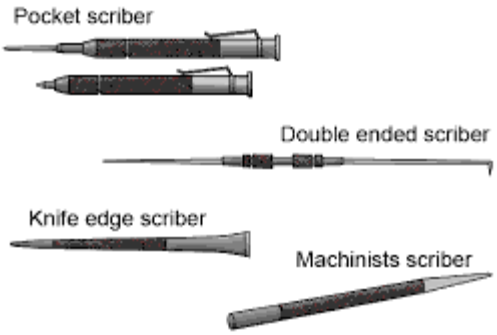
The surface plate is a small table with a flat surface. It is used to test whether other surfaces are flat enough. It is also used as a surface to mark out metals.

Surface plates are made with perfectly flat surface. Sometimes ribs are created underneath to make sure it does not bend at all. The most important part of the plate is that flat surface. The surface plate is used by smearing a marking compound such as “engineer’s blue” on it after it has been mixed with oil. The metal whose surface is to be marked is then placed on the surface plate.

To mark a number of lines paralleled with a tone edge, the tone edge is placed on the surface plate and the lines are scubed with surface gauge.

Scriber:

A scriber is made of a tool steel and has a sharp point to scratch a line on a metal. The point is sharpened by holding the scriber at an angle on a power grinder and rotating it.



Calipers:

Calipers are used to mark as well as to measure metals. They are used to measure the diameter of the objects being formed. There are about three types of calipers; outside calipers, inside calipers and odd-leg calipers.

Outside calipers are used to mark the outside of bars and rods while inside calipers are used to mark the bore of tubes and the tone-ness of parallel surfaces. The odd-leg calipers are used on the lathe for scribing a line round the work. They are also used for marking the center of the end of a bar or for drawing lines parallel to a straight edge. One leg of the odd leg caliper has a point which is hardened while the other leg is similar to outside calipers.

Dividers:

Dividers are used for marking out circles, arcs and radii. The length of the legs determines the size. The legs are made of steel and the top hoop of spring steel.

After marking the sheet metal, the next exercise is to measure the metal. This is done with the use of steel rule, protractor, etc.

HOLDING DEVICES:

It is necessary that there should be a means of holding wood and metals firmly on a workbench or on a machine tool in order to have a successful operation on them. Examples

of some holding devices are bench hook, bench vice, G-Clamp, sash clamp etc. The work holding devices to be considered here include vices and clamps.

Vices –

- **Bench Vice:** Bench vice is used to hold wood and metal for filing, sawing, chiseling and tapping. They are fitted into the edge of the workbench by bolts and nuts. They have serrated jaws for proper gripping, the jaw is tightened by rotating the bar.

- **Hand Vice:** The hand vice is not fixed to anything as the bench vice, it is held by the hand. The work piece is put in between the two arms of the vice and it is tightened by means of screw.

- Machine Vice: The machine vice looks like a bench vice, it is however not fixed on the machine tool bed. It can be rotated for machining at any desired angle.

Cramps/Clamps –

1. Pliers: Pliers are work holding devices held in the hand of users. It is used for gripping and cutting wire and thin metal sheets. Pliers come in different forms, their forms give them their different names mentioned below:

- Long nose pliers
- Cutting pliers
- Gripping pliers
- Combination pliers

The handle of pliers used by electrician is insulated with rubber to prevent electric shock.

2. Corner Clamp (Metre Clamp): This is used to hold work piece at right angle while gluing and pinning.

3. Sash Cramp: This is a large clamp used for holding and drawing parts of a work piece together while gluing. It is also called T-Cramp.

4. 'G' Cramp: This is a metal clamp used for holding a work piece while sawing or chiseling.

5. Bench Holdfast: This is also used to hold job firmly on the bench when moulding or rebating.

6. Bench Hook: This is another device used to hold job to the bench while sawing or chiseling. It is also used to protect the bench.

ASSESSMENT

What is a measuring tool?

List THREE measuring tools?

Week 5

Metal Work (cont'd)

Outline:

- Driving tools
- Boring tools/Cutting tools
- Care and maintenance

DRIVING TOOLS:

Driving tools are used to fix nails and screws into wooden and metal materials. Nails are the iron material with the flat head and a stem with a sharp end. The stem is usually smooth. Screws look like nails but they have turned (twisted) stem.

NAILS