

TECHNOLOGY AND LIVELIHOOD EDUCATION (Basic Electricity)
PART I – CONTENT UPDATE

ELECTRICITY

- From the Greek word ἤλεκτρον, (elektron), meaning amber, and
- From New Latin *electricus*, "amber-like".
- It is a general term that encompasses a variety of phenomena resulting from the presence and flow of electric charge.
- A class of phenomena arising from the existence of charge.
- A form of energy, caused by the behavior of electrons and protons
- It is the flow of electrical power or charge
- Is a basic part of nature and it is one of our most widely used forms of energy.
- A fundamental entity of nature consisting of negative and positive kinds.
- A property of certain fundamental particles of all matter, as electrons (negative charges) and protons or positrons (positive charges) that have a force field associated with them and that can be separated by the expenditure of energy: electrical charge can be generated by friction, induction, or chemical change and is manifested by an accumulation of electrons on an atom or body, constituting a negative charge, and a loss of electrons, constituting a corresponding positive charge
- The potential difference (voltage) across an ideal conductor is proportional to the current through it.
- Electricity is measured in units of power called watts.
- It was named to honor James Watt, the inventor of the steam engine

Terminologies:

1. Electric charge
 - A property of some subatomic particles, which determines their electromagnetic interactions. Electrically charged matter is influenced by, and produces, electromagnetic fields.
2. Electric current
 - A movement or flow of electrically charged particles, typically measured in amperes.
 - Describes a flow of electric charge. Electric current is either Direct Current (DC) a single-direction flow, or Alternating Current (AC) which describes a current that repeatedly changes direction.
3. Electric field
 - An influence produced by an electric charge on other charges in its vicinity.
4. Electrical energy
 - Is a form of energy present in an electric field or magnetic field, electrical energy is measured in joules?
 - It can be converted to work though the use of an electrical device or machine such as electric motor.
5. Electric potential
 - The capacity of an electric field to do work, typically measured in volts.
6. Electromagnetism
 - A fundamental interaction between the magnetic field and the presence and motion of an electric charge.
7. Electric power
 - Is the name given to electrical energy production and distribution

SOURCES OF ELECTRICITY

1. **Biomass Energy**
 - Biomass describes all solid material of animal or vegetable origin from which energy may be extracted it also called solid biomass.
 - Plant products (such as corn husks, branches, or peanut shells), waste paper, and cow dung are examples of biomass fuels.
 - Biomass can be heated, burned, fermented, or treated chemically to release energy.
 - Biomass is produced by photosynthesis; basic research in photosynthesis may provide systems that directly convert sunlight into fuels.
 - Biomass can also be used a fuel for space heating and factory processing, and to produce liquid transportation fuel such as ethanol.

Advantages of Biomass Energy

- a. Renewable energy source
- b. Very low greenhouse gas emissions
- c. Can produce energy on-demand
- d. Energy is easily stored

Disadvantages of Biomass Energy

- a. Low energy return on investment
- b. High air pollution emissions
- c. Very high water and land requirements
- d. High occupational hazards

2. **Geothermal Energy**

- *Geo* means earth and *thermal* means heat. Meaning geothermal energy is the heat energy of the earth.
- Geothermal Energy can be harnessed from the Earth's natural heat associated with active volcanoes or geologically young inactive volcanoes still giving off heat at depth.

- Steam from high-temperature geothermal fluids can be used to drive turbines and generate electrical power, while lower temperature fluids provide hot water for space-heating purpose, heat for greenhouses and industrial uses, and hot or warm springs at resort spas.

3. Hydropower

- The term hydro comes from an ancient Greek word for water
 - The force of moving water from rivers or storage reservoirs
 - The process starts with the annual hydrologic, or water cycle, providing seasonal rain and runoff from snow pack. The runoff from rain and snow collects in lakes, streams and rivers and flows to dams downstream. The water funnels through a dam, into a powerhouse and turns a large wheel called a turbine. The turbine turns a shaft that rotates a series of magnets past copper coils in a generator to create electricity. The water then returns to the river. From the powerhouse, transmission lines carry electricity to communities.
- Very high return on energy investment
 - Very low greenhouse gas emissions
 - Very low air pollution emissions
 - Inexpensive once dam is built
 - Can produce energy on-demand
 - Provide water storage and flood-control

Disadvantages of Hydropower

- Very high land requirements
- Extremely high impacts to land and water habitat
- Best sites are already developed or off-limits
- Disastrous impacts in case of dam failure

4. Ocean Power

Oceans have tremendous energy in the movement of their currents and waves.

There are two kinds of marine currents: two-way (tidal) currents, and one-way currents.

1. *Two-way currents* are the ocean tides, caused by gravitational pull of the moon and sun. Each heavenly body pulls on the part of the ocean nearest to it, causing bulges in water height. As the earth rotates, those bulges move in relation to the world's coastlines, pulling water onto and away from the shore. So the turning of the earth causes a moving pattern in the ocean: at every coast in turn, the level rises and falls, resulting in two high tides and two low tides daily.
2. *One-way currents* are like massive —riversll of ocean water flowing within the ocean for hundreds — sometimes thousands — of miles.

5. Solar Energy

- Solar Energy, provided by the sun is the most inexhaustible and cleanest source of energy known. Its heat and light arrive week in and week out - free. But not in uniform amounts each day, or in concentrated form, and not at all at night. Consequently, the barriers to greater use of solar energy by a world faced with dwindling energy resources are significant: mainly, diffusion and the inability economically to store solar energy, use it directly, or convert it to electricity.
- Renewable energy source
 - Very low greenhouse gas emissions
 - Very low air pollution emissions
 - Very low water requirements
 - Modular, low-profile, low-maintenance
 - Very safe for workers and public

Disadvantages of Solar Energy

- Intermittent energy source
- High land requirements
- Expensive
- Manufacture involves some toxics

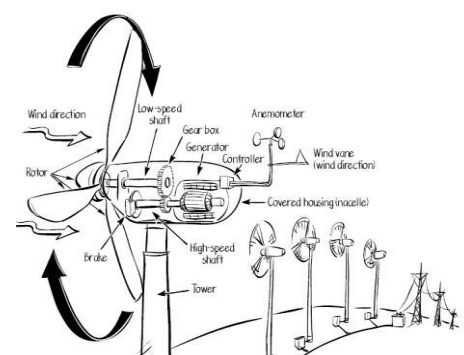
6. Wind Power

- Wind power is a renewable resource. Wind is a form of solar energy.
- The basic machinery that converts wind power to electricity is called a wind turbine. The force of the wind spins blades attached to a hub that turns as the blades turn. Together, the blades and hub are called the rotor. The turning rotor spins a generator, producing electricity.
- Mankind has been making use of wind power for centuries. One of the first known uses was to propel sailing ships. This was followed, centuries later, by the development of windmills.

Advantages of Wind Power

- Renewable energy source
- Very low greenhouse gas emissions
- Very low air pollution emissions
- Very low water requirements
- Very safe for workers and public

Disadvantage of Wind Power



- a. Intermittent energy source
- b. Limited to windy areas
- c. Potentially high hazard to birds
- d. Moderate land requirements

7. Coal Energy

- Coal is a rock that burns as it releases energy. It is mostly made of the chemical element carbon.
- Some coal is brown and crumbly, and some coal is hard, black, and glossy.
- The greater the percentage of the coal that is carbon, the higher its rank or potential energy.
- Coal is among the fossil fuels along with oil (petroleum), and natural gas. The fossil fuels are considered non-renewable energy resources.

Advantages of Coal Energy

- a. Inexpensive
- b. Abundant
- c. Low land requirements
- d. Can produce energy on-demand

Disadvantages of Coal Energy

- a. Non-renewable energy source
- b. Very high greenhouse gas emissions
- c. Very high air pollution emissions
- d. High land/water impacts from acid rain, mine drainage
- e. Highly hazardous occupation

8. Nuclear Energy

- Nuclear energy is the energy trapped inside atoms, those tiny particles from which all matter is made.
- The principle of producing electricity by heat is the same in nuclear power production as in coal or oil based energy production. By heat, the water is boiled to high pressure steam. The steam rotates the turbine. The generator attached to the turbine generates electricity. In a nuclear power plant the heat needed for producing electricity is generated in a nuclear reactor by the fission of atomic nuclei.
- In the energy production, nuclear energy replaces fossil fuels, mainly coal, which poses significant environmental hazards. Of the new energy forms, nuclear power is so far the only one ready for large-scale energy production.
- Nuclear power is economical and the annual fuel reserve of a nuclear power plant can be transported in just a few truck loads.

Advantages of Nuclear Energy

- a. Low greenhouse gas emissions
- b. Low air pollution emissions
- c. Low land requirements for power plants (though not for waste storage)
- d. Can produce energy on-demand

Disadvantages of Nuclear Energy

- a. Non-renewable energy source
- b. High water requirements
- c. Relatively expensive
- d. Waste remains dangerous for thousands of years
- e. Serious accident would be disastrous

9. Natural Gas

- Natural Gas is made up mostly of methane.
- Methane, a combination of hydrogen and carbon, is formed when plants and animals (organic matter) are trapped beneath the sedimentary layers of the earth.

Advantages of Natural Gas

- a. Inexpensive
- b. Low land requirements
- c. Can produce energy on-demand
- d. Relatively safe for workers and public

Disadvantages of Natural Gas

- a. Non-renewable energy source
- b. High greenhouse gas emissions
- c. Relatively moderate air pollution emissions
- d. Danger of explosion if handled improperly

TYPES OF ELECTRIC CURRENT

Alternating Current (AC)

- An electric charge would for instance move forward, then backward, then forward, then backward, over and over again.
- Voltage or current that changes polarity or direction, respectively, over time.
- The back-and-forth motion occurs between 50 and 60 times per second, depending on the electrical system of the country.
- This is called the frequency and is designated as either 50 Hertz (50Hz) or 60 Hertz (60Hz).

Direct Current (DC)

- The movement (or flow) of electric charge is only in one direction.
- The voltage or current that maintains constant polarity or direction, respectively, over time.

Source of Direct Current

Chemical battery

- Electronic power supply
- Mechanical Generator

KINDS OF ELECTRICITY

Static electricity

Electricity at rest

- The attraction between positive and negative charge particles.
- It refers to the buildup of electric charge on the surface of objects.
- The static charges remain on an object until they either bleed off to ground or are quickly neutralized by a discharge.
- It is notable as a physical phenomenon that can be demonstrated using simple experiments that can convey genuine understanding of the physics involved.
- Electricity produced by friction
- An electrical charge that builds up due to friction between two dissimilar materials. Friction removes some electrons from one object and deposits them on the other.
- The buildup or imbalance of the same charges. Static electricity is at rest until discharged.
- The electricity associated with electric charges, which tends to stay _static_ rather than flowing away
- Movement of charges from one object to another without further movement
- An electrical charge frequently found in paper which is too dry or which has been affected by local atmospheric conditions.
- It refers to the net presence (or 'imbalance') of charge on a body, usually caused when dissimilar materials are rubbed together, transferring charge from one to the other.

Dynamic Electricity

- A flow of electric charge
- Also known as electric current
- Electricity in motion
- The movement of positive and negative charge particles.
- A flow of electric charge constitutes an electric current.
- the direction of current was described in terms of the motion of imaginary positive charges

Electrical Components in Installing Electrical House

Wiring Electrical Symbols

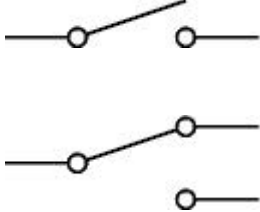
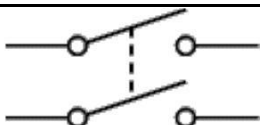
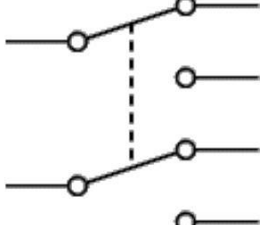
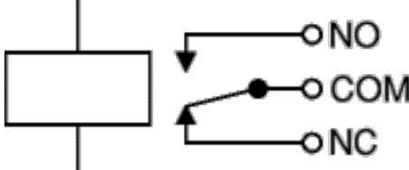
Circuit symbols are used in circuit diagrams which show how a circuit is connected together. The actual layout of the components is usually quite different from the circuit diagram.

1. Wires and connections



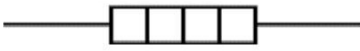

Component	Circuit Symbol	Function of Component
Wire		To pass current very easily from one part of a circuit to another.
Wires joined		A 'blob' should be drawn where wires are connected (joined), but it is sometimes omitted. Wires connected at 'crossroads' should be staggered slightly to form two T-junctions, as shown on the right.
Wires not joined		In complex diagrams it is often necessary to draw wires crossing even though they are not connected. I prefer the 'hump' symbol shown on the right because the simple crossing on the left may be misread as a join where you have forgotten to add a 'blob'!




2. Switches

Component	Circuit Symbol	Function of Component
Push Switch (push-to-make)		A push switch allows current to flow only when the button is pressed. This is the switch used to operate a doorbell.
Push-to-Break Switch		This type of push switch is normally closed (on), it is open (off) only when the button is pressed.
On-Off Switch (SPST)		SPST = Single Pole, Single Throw. An on-off switch allows current to flow only when it is in the closed (on) position.
2-way Switch (SPDT)		SPDT = Single Pole, Double Throw. A 2-way changeover switch directs the flow of current to one of two routes according to its position. Some SPDT switches have a

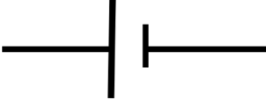



		central off position and are described as 'on-off-on'.
Dual On-Off Switch (DPST)		DPST = Double Pole, Single Throw. A dual on-off switch which is often used to switch mains electricity because it can isolate both the live and neutral connections.
Reversing Switch (DPDT)		DPDT = Double Pole, Double Throw. This switch can be wired up as a reversing switch for a motor. Some DPDT switches have a central off position.
Relay		An electrically operated switch, for example a 9V battery circuit connected to the coil can switch a 230V AC mains circuit. NO = Normally Open, COM = Common, NC = Normally Closed.

3. Output Devices: Lamps, Heater, Motor, etc.

Component	Circuit Symbol	Function of Component
Lamp (lighting)		A transducer which converts electrical energy to light. This symbol is used for a lamp providing illumination, for example a car headlamp or torch bulb.
Lamp (indicator)		A transducer which converts electrical energy to light. This symbol is used for a lamp which is an indicator, for example a warning light on a car dashboard.
Heater		A transducer which converts electrical energy to heat.
Motor		A transducer which converts electrical energy to kinetic energy (motion).

Bell		A transducer which converts electrical energy to sound.
Buzzer		A transducer which converts electrical energy to sound.
Inductor (Coil, Solenoid)		A coil of wire which creates a magnetic field when current passes through it. It may have an iron core inside the coil. It can be used as a transducer converting electrical energy to mechanical energy by pulling on something.

4. Power Supplies

Component	Circuit Symbol	Function of Component
Cell		Supplies electrical energy. A single cell is often wrongly called a battery, but strictly a battery is two or more cells joined together.
Battery		Supplies electrical energy. A battery is more than one cell.
DC supply		Supplies electrical energy. DC = Direct Current, always flowing in one direction.
AC supply		Supplies electrical energy. AC = Alternating Current, continually changing direction.
		A safety device which will 'blow' (melt) if the

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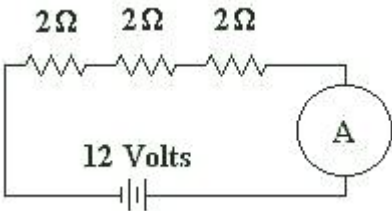
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Fuse		current flowing through it exceeds a specified value.
Transformer		Two coils of wire linked by an iron core. Transformers are used to step up (increase) and step down (decrease) AC voltages. Energy is transferred between the coils by the magnetic field in the core. There is no electrical connection between the coils.
Earth (Ground)		A connection to earth. For many electronic circuits this is the 0V (zero volts) of the power supply, but for mains electricity and some radio circuits it really means the earth. It is also known as ground.

TYPES OF ELECTRICAL CIRCUIT

Series Circuit

- The amount of current passing through one load is the same amount that passes through the other loads.
- The individual voltage drop across each load may vary from one another depending upon their resistances.
- The sum of all the individual voltage drops is equal to the voltage of the source.
- If one load is open (defective) other loads will not function as well.



- Are connected in a straight line, like a chain.
- All current remains the same throughout the circuit.
- There can be many different voltages in a series circuit, as a voltage drop appears across every resistor.
- The total voltage in a series circuit is equal to the sum of all the individual voltage drops within the circuit.

$$E_{\text{Total}} = E_1 + E_2 + E_3 + \text{etc...}$$
- The total resistance in a series circuit is equal to the sum of all the individual resistances within the circuit.
- The formula for Resistance in Series is:

$$R_{\text{Total}} = R_1 + R_2 + R_3 + \text{etc...}$$

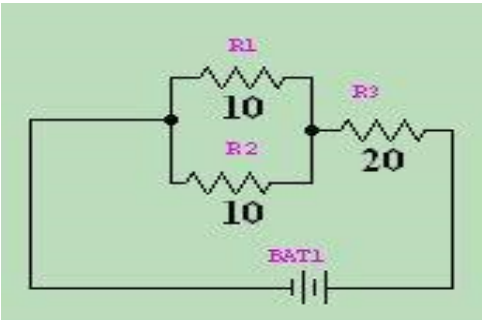
Parallel Circuit

- The total current (It) is equal to the summation of the individual currents.
- The voltage drop across each load is the same.
- When load is open (defective), the other will not be affected.
- Are connected allowing multiple paths for current flow.
- All voltage remains the same throughout the circuit.
- There can be many different currents in a parallel circuit, as each leg has the same voltage, but can have a different resistance.
- The total current in a parallel circuit is equal to the sum of all the individual currents on each leg of the circuit.
- The formula for Current in Parallel is:
- Resistance is found by reciprocating the sum of the reciprocals of the resistance of the individual branches
- The formula for Resistance in Parallel is:

$$\frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} + \frac{1}{R_x \dots}}$$

Series and Parallel Circuit

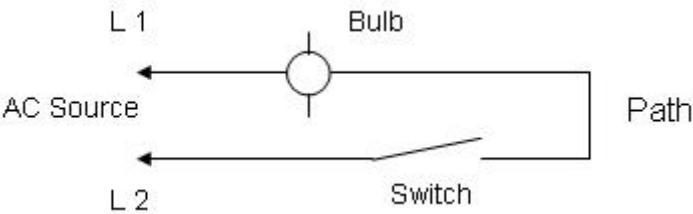
- Combination of series and parallel connection in one circuit.



PARTS OF A SIMPLE ELECTRICAL CIRCUIT

A complete circuit consists of a device or board, a path for the current flow, a method of control and a source of electrical energy.

Schematic diagram



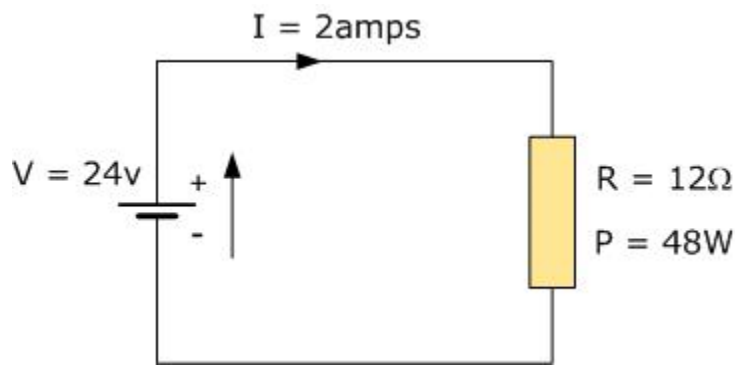
- Load** – are electrical device like lighting fixture and appliances that consumes electrical energy.
- Path** – are wire use as conductor of electricity which provides passage for electric current from the source and back.
- Control** – is an electrical device that control or turns the circuit on and off conveniently.
- Source** – are electrical energy coming from either alternating current or direct current that provides electrical power to the circuit.

OHM'S LAW in Household Electrical House Wiring

- Ohm's Law discovered by the German physicist Georg Ohm, (1787 - 1854).
- It deals with the relationship between voltage and current in an ideal conductor.
- It states that the current through a conductor between two points is directly proportional to the potential difference or voltage across the two points, and inversely proportional to the resistance between them.
- Material that obeys Ohm's Law is called "ohmic" or "linear" because the potential difference across it varies linearly with the current
- Ohm's Law defines the relationships between (P) power, (E) voltage, (I) current, and (R) resistance. One ohm is the resistance value through which one volt will maintain a current of one ampere.
- (I) Current is what flows on a wire or conductor like water flowing down a river. Current flows from negative to positive on the surface of a conductor. Current is measured in (A) amperes or amps.
- Current indicates the amount of electrons passing through the wire and is measured in amperes or **amps** for short.
- To find Current: $I = V \div R$ or $I \text{ (amps)} = V \text{ (volts)} \div R \text{ (}\Omega\text{)}$
- (E or V) Voltage is the difference in electrical potential between two points in a circuit. It's the push or pressure behind current flow through a circuit, and is measured in (V) volts.
- Voltage is the electrical potential energy and is measured in volts.
- To find voltage: $V = I \times R$ or $V \text{ (volts)} = I \text{ (amps)} \times R \text{ (}\Omega\text{)}$
- (R) Resistance determines how much current will flow through a component. Resistors are used to control voltage and current levels. A very high resistance allows a small amount of current to flow. A very low resistance allows a large amount of current to flow. Resistance is measured in **ohms**, and the unit symbol for it is the Greek letter omega, Ω .
- Electrical resistance can be thought of as the "friction" on the movement of electrons in a wire.
- To find resistance: $R = V \div I$ or $R \text{ (}\Omega\text{)} = V \text{ (volts)} \div I \text{ (amps)}$
- (P) Power is the amount of current times the voltage level at a given point measured in wattage or watts.
- Power is the rate of doing work.
- To find Power (P) $P = V \times I$ or $P \text{ (watts)} = V \text{ (volts)} \times I \text{ (amps)}$
Also, $P = V_2 \div R$ or $P \text{ (watts)} = V_2 \text{ (volts)} \div R \text{ (}\Omega\text{)}$
Also, $P = I_2 \times R$ or $P \text{ (watts)} = I_2 \text{ (amps)} \times R \text{ (}\Omega\text{)}$

Example using Ohm's Law in a Circuit

For the circuit shown below find the Voltage V, the Current I, the resistance R and the Power P.



Answer:

Voltage $V = I \times R$
 $= 2 \times 12\Omega = 24V$

Current $I = V \div R$
 $= 24 \div 12\Omega = 2A$

Resistance $R = V \div I$
 $= 24 \div 2 = 12 \Omega$

Power $P = V \times I$
 $= 24 \times 2 = 48W$

PROCEDURE IN ELECTRICAL HOUSE WIRING

Basic Principles of Good Wiring

- a. Before beginning any electrical repair, shut off the power. Remove the fuse or trip the breaker for the circuit you will be working on in your service panel. Use a neon tester to be sure the power is off. If there is any doubt, you can remove the main fuse or trip the main breaker. Remember: Removing the main fuse or tripping the main breaker will usually shut off the power to the entire house.
- b. Electrical wires are color coded to prevent wiring errors.
- c. White wires almost always connect to other white wires or to chrome terminal screws on switches and receptacles.
- d. Some wiring devices—such as receptacles—are back-wired by pushing the bare wire end into spring grip holes. These wiring devices are plainly labeled to show which color goes into each spring grip hole.
- e. Switches are nearly always connected into black wires in cables. The only exception is where a cable is extended, making it necessary for the white wire to play the role of the black wire. When this is necessary, the white wires should be painted black to prevent future wiring errors.
- f. Study the wiring diagram. This will help you understand the basic principles of good wiring. Also, find a good electrical how-to book. It's one book every homeowner should keep on hand for ready reference.
- g. Most home wiring is complete with either No. 14 gauge or No. 12 gauge wiring. No. 14 is the smallest wiring permitted under most codes.
- h. Always use the same size cable for a continuation of extended wiring any circuit.

Single-pole switch

A single-pole switch is the most basic of all electrical switching. When the switch is in the ON position, it completes the circuit and supplies power to the device. When in the OFF position, the switch disconnects power from the device.

How to replace a single pole switch.

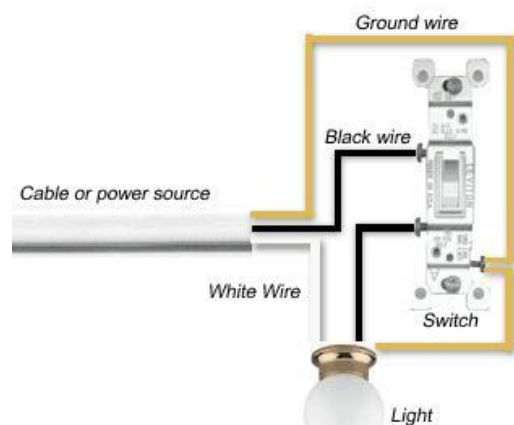
This is a fairly simple thing to do with only a few things to keep in mind.

Turn the power off to the circuit.

- 1. Double check that the power is off.
- 2. Remove cover plate.
- 3. Remove existing switch from the box while keeping the wires attached.
- 4. If it is a single pole switch you should have 3 wires connected to it, the feed, the switch leg and the ground.
- 5. Remove wires from existing switch and connect them to the new switch.
- 6. Install the new switch back into the box.
- 7. Replace the cover plate.
- 8. Turn the power back on.
- 9. Test your work.

Installing a new light and switch.

- 1. Determine the current for the circuit that will determine what size cable you will use.
- 2. Run your feed cable from the electrical panel to your switch location.
- 3. Run your switch cable from the switch location to the light fixture or fixtures.



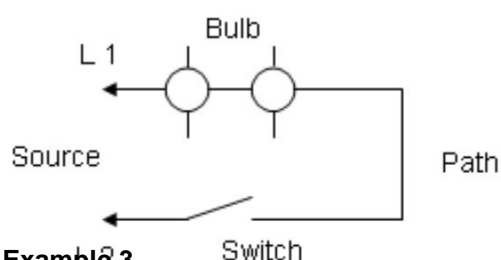
4. Install an electrical box at the switch location and at every light fixture location. Make sure the box is rated for the weight of the light fixture. If you are installing a ceiling fan you will need a fan rated box.
5. Install your light fixtures.
6. Make your connections to the switch. Splice the white or neutral wires together. Connect the black wires to the switch terminals. Connect your ground to the switch ground terminal and the box if it is metal.
7. Install the switch into the box.
8. Install your cover plate.
9. Connect your feed cable in your main electrical panel to the proper size circuit breaker, and ground/ neutral bar.
10. Test your work.

HOUSE WIRING

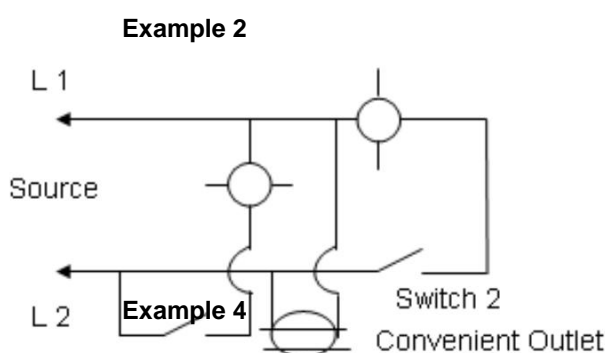
House wiring must conform to existing laws and regulations of the National Electrical Code as well as the City or Local Ordinances enforced and applied in the specific localities. House wiring methods approved by the National Fire Protection Association include open conductors, concealed knob and tube wiring, surface metal raceways, armored cable, under floor raceways, non-metallic sheathed cable, electrical metallic tubing, cast-in-place raceways, wire ways and house ways.

Wiring Connections

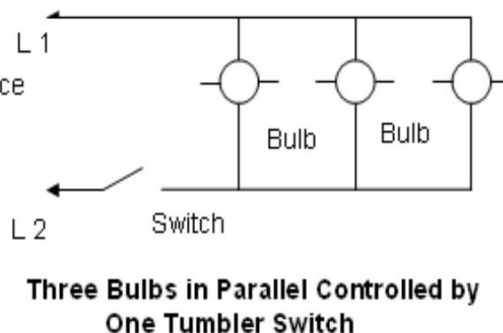
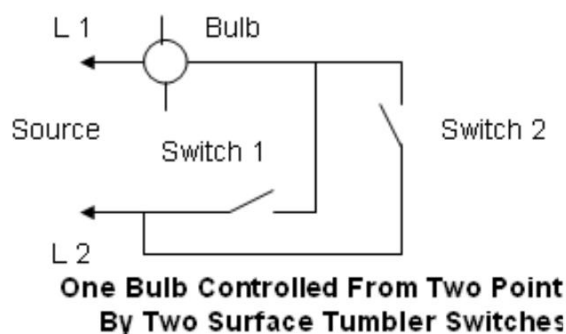
Example 1



Example 2



Example 3



Wooden Raceways Method

Wooden raceway is made of dry and quality wood and usually consists of backing and capping. The backing is provided with grooves to hold the wires in position without the capping.

Wooden raceways are classified according to the number of grooves they have. Usually the raceways measures 6', 8' 10' and 12'. The width of the grooves depends on the size of the wires to be used in the wiring installation. Small common wire nail is use to fasten the wooden raceways on the wiring surface.

Materials use I wooden raceways connection

1. cut-out 2 circuit porcelain 20 Amp.
2. Safety switch single phase, 30 amp, fuse
3. Cutout box 5llx8ll x3ll
4. Junction box
5. Porcelain tee
6. convenience outlet, surface type
7. 3 way switch surface type
8. Wooden raceways
9. Mica tubing
10. Ill cw nail

The Philippine Electrical code requires the surface wooden raceways may be used in exposed dry locations, and where the maximum potential difference between conductors does not exceed 300 volts. It shall not be use in the following:

1. for concealed wiring
2. where it may be subjected to mechanical injury

3. in hoist ways
4. in elevator shaft
5. in hazardous location

Wooden raceways are terminated by boxes, switches and other fittings, shall be provided with a W -cut to accommodate the mica tubing inserted over the conductors.

FUNDAMENTALS OF ELECTRONIC ELECTRONICS

- It refers to the flow of charge (moving electrons) through [nonmetal](#) conductors (mainly semiconductors).
- The study of the flow of charge through various materials and devices such as, semiconductors, resistors, inductors, capacitors, nano-structures, and vacuum tubes. All applications of electronics involve the transmission of power and possibly information.

DEFINITION OF TERMS

1. **Electronic components** - is any physical entity in an electronic system whose intention is to affect the electrons or their associated fields in a desired manner consistent with the intended function of the electronic system
2. **Electrical Circuit** - is a network that has a closed loop, giving a return path for the current
3. **Network** - is a connection of two or more components, and may not necessarily be a circuit
4. **Conductors** – are metals and other substances where electrons can move freely
5. **Insulators** – substances where electrons cannot move freely
6. **Transformer** – is an electronic device used in producing desired voltage
7. **Inductors** – the choke or coil in a circuit that opposes changes in electric current
8. **Semiconductors** – a group that are neither good conductors nor good insulators

BASIC ELECTRONIC TOOLS

7. **Electric Drill and Drill Bits** - in the range of 1/8 inch to 1/2 inch will come in handy when you need to drill holes on the printed circuit board that has been etched. Drilling of plastic or metal enclosure that houses the printed circuit board are sometimes necessary.
 8. **Soldering Iron** - a 20 Watt to 30 Watt soldering iron with tips of 1/8 inch to 1/2 inch can be used for soldering of through hole components. Soldering of surface mount components may require smaller tips depending on the sizes of the components. Soldering iron normally will last a long time if it is taken care of properly by keeping the tips clean and well tinned.
 9. **Disordering Pump** - A pump aids in the removal of the liquid solder. It is operated by a spring-loaded vacuum pump and controlled by a simple trigger.
 10. **Vacuum Pick Up Tool** - A pick and place head for transferring die or chips containing electronic circuitry from wafer packs to substrates prior to lead bonding operations.
 11. **Soldering Stand** - It keeps the iron away from flammable materials
 12. **Helping Hand Tool** - A crucial tool in doing successful electronics work. It consists of a weighted base, arms ending in alligator clips, magnifying glass and flexible joint.
-
1. **Wire stripper** - is used to strip off wire insulator from its conductor before it is used to connect to another wire or soldered into the printed circuit board. Some wire stripper or wire cutter has a measurement engraved on it to indicate the length that will be stripped.
 2. **Long nose Pliers** – a 4-inch long nose pliers will come in handy when you need to hold components that have short leads that need to be soldered onto the PCB but will be too hot to handle with bare hands. It will also be useful to hold the component that needs to be de-soldered from the board.
 3. **Side-Cutting Pliers** - 4-inch side cutting pliers will come in handy as one of the electronic tools when one needs to trim off excess component leads on the printed circuit board. It can also be used to cut wires into shorter length before being used.
 4. **Small tweezers** - is used to hold small components especially when doing soldering and de-soldering of surface mount components.
 5. **Allen Wrench set** - set is sometimes used to unscrew or screw Allen type of screws.
 6. **Philips Head Screwdrivers** - various sizes of Philips head screwdrivers will be handy as a lot of electronics projects that use screws are Philips Head type.
 7. **Flat Head Screwdrivers** - of various sizes are also necessary as many screws that are used are of this type.
 8. **Hammer** - a small, light hammer will be useful when assembling projects that involved casing.
 9. **Socket wrench** - sets that include nut drivers, hex drivers, and starters in assorted sizes will come in handy during the assembly work of electronics project.
 10. **Pocket Knife** - will be useful when one needs to cut PCB, wires or remove some cooper from the printed circuit board.

Maintenance Tips of Electronic Tools

Good quality tools that are being purchased can last a lifetime if they are taken care of properly.

- Ensure that the tools are used only for their intended purposes.
- Keep them lubricated with a light film of oil to inhibit rust.
- Keep the tools clean and sharp; keep the soldering tips clean and well tinned.
- Ensure that proper uses of the tools are always adhered to by following the instructions of using the tools.

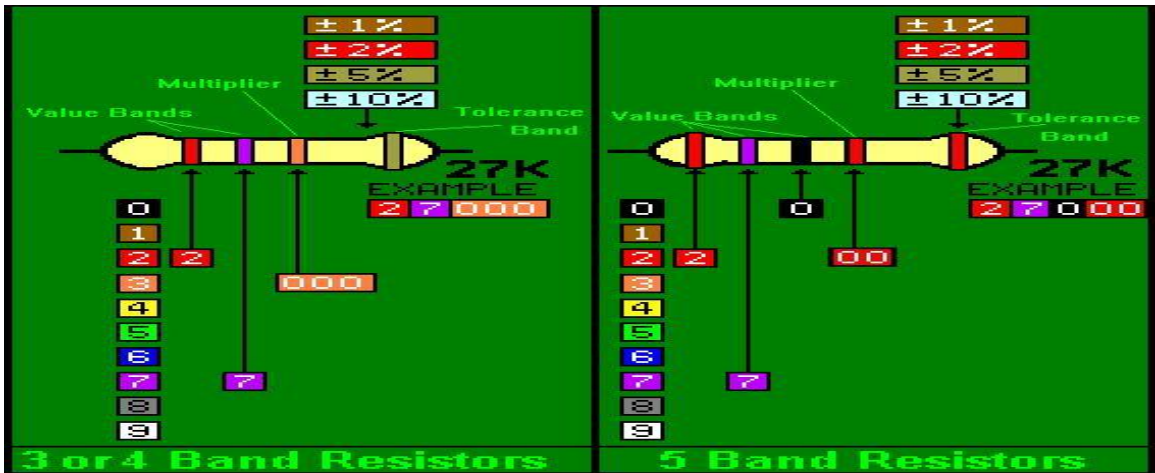
- ### Type of Resistor

- Film or Cermet Resistor
- Wire-Wound Resistors
- Metal oxide film resistors
- Vitreous Enamel Resistors
- Cement resistors
- Semiconductor Resistors

Resistor Color Coding

Color	1 st band	2 nd band	3 rd band (multiplier)	4 th band (tolerance)	Temp. Coefficient
Black	0	0	×10 ⁰		
Brown	1	1	×10 ¹	±1% (F)	100 ppm
Red	2	2	×10 ²	±2% (G)	50 ppm
Orange	3	3	×10 ³		15 ppm
Yellow	4	4	×10 ⁴		25 ppm
Green	5	5	×10 ⁵	±0.5% (D)	
Blue	6	6	×10 ⁶	±0.25% (C)	
Violet	7	7	×10 ⁷	±0.1% (B)	
Gray	8	8	×10 ⁸	±0.05% (A)	
White	9	9	×10 ⁹		
Gold			×10 ⁻¹	±5% (J)	
Silver			×10 ⁻²	±10% (K)	
None				±20% (M)	

Example



Types of
Circuit Board

- **Breadboard**
Temporary, no soldering required
This is a way of making a temporary circuit, for testing purposes or to try out an idea.
No soldering is required and all the components can be re-used afterwards.
It is easy to change connections and replace components



- **Strip board**

Permanent, soldered

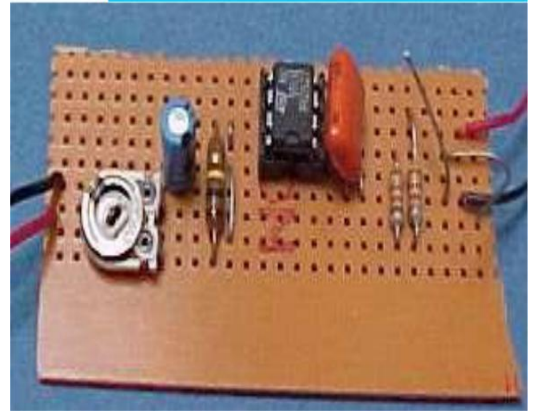
Strip board has parallel strips of copper track on one side. The strips are 0.1" (2.54mm) apart and there are holes every 0.1" (2.54mm).

Strip board requires no special preparation other than cutting to size. It can be cut with a junior hacksaw, or simply snap it along the lines of holes by putting it over the edge of a bench or table and pushing hard.

- **Printed Circuit Board**

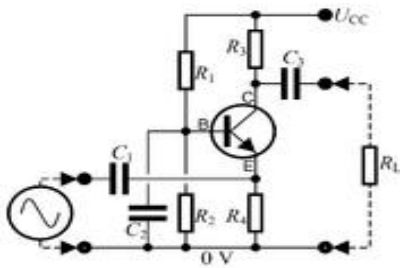
Permanent, soldered

Printed circuit boards have copper tracks connecting the holes where the components are placed.



ELECTRONIC SCHEMATIC DIAGRAM

Simple Amplifier Circuit Diagram

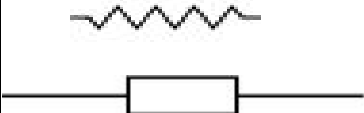
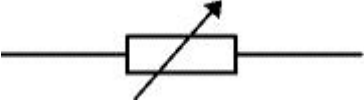
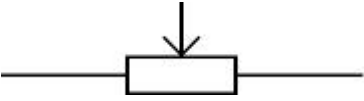
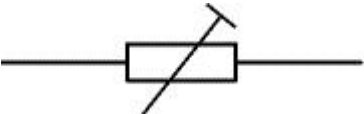


Physical circuit

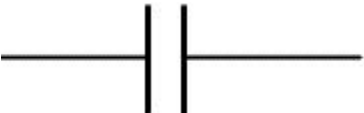

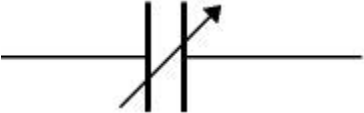
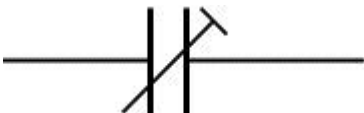


ELECTRONIC SYMBOLS


1. Resistor

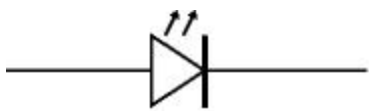
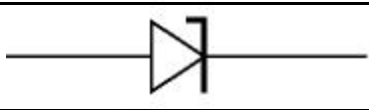
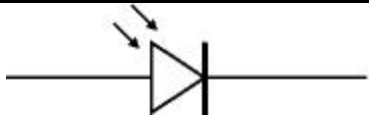
Component	Circuit Symbol	Function of Component
Resistor		A resistor restricts the flow of current, for example to limit the current passing through an LED. A resistor is used with a capacitor in a timing circuit.
Variable Resistor (Rheostat)		This type of variable resistor with 2 contacts (a rheostat) is usually used to control current. Examples include: adjusting lamp brightness, adjusting motor speed, and adjusting the rate of flow of charge into a capacitor in a timing circuit.
Variable Resistor (Potentiometer)		This type of variable resistor with 3 contacts (a potentiometer) is usually used to control voltage. It can be used like this as a transducer converting position (angle of the control spindle) to an electrical signal.
Variable Resistor (Preset)		This type of variable resistor (a preset) is operated with a small screwdriver or similar tool. It is designed to be set when the circuit is made and then left without further adjustment. Presets are cheaper than normal variable resistors so they are often used in projects to reduce the cost.

2. Capacitors

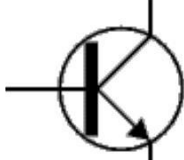

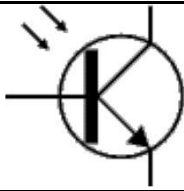
Component	Circuit Symbol	Function of Component
Capacitor		A capacitor stores electric charge. A capacitor is used with a resistor in a timing circuit. It can also be used as a filter, to block DC signals but pass AC signals.
Capacitor, polarized		A capacitor stores electric charge. This type must be connected the correct way round. A capacitor is used with a resistor in a timing circuit. It can also be used as a filter, to block DC signals but pass AC signals.
Variable Capacitor		A variable capacitor is used in a radio tuner.
Trimmer Capacitor		This type of variable capacitor (a trimmer) is operated with a small screwdriver or similar tool. It is designed to be set when the circuit is made and then left without further adjustment.

3. Diodes


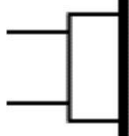
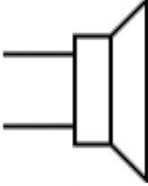
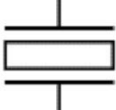
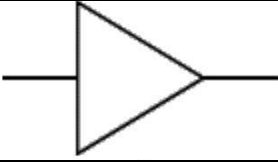

Component	Circuit Symbol	Function of Component
Diode		A device which only allows current to flow in one direction.
LED		A transducer which converts electrical

Light Emitting Diode		energy to light.
Zener Diode		A special diode which is used to maintain a fixed voltage across its terminals.
Photodiode		A light-sensitive diode.






4. Transistor

Component	Circuit Symbol	Function of Component
Transistor NPN		A transistor amplifies current. It can be used with other components to make an amplifier or switching circuit.
Transistor PNP		A transistor amplifies current. It can be used with other components to make an amplifier or switching circuit.
Phototransistor		A light-sensitive transistor.

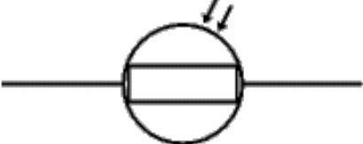

5. Audio and Radio Devices

Component	Circuit Symbol	Function of Component
Microphone		A transducer which converts sound to electrical energy.
Earphone		A transducer which converts electrical energy to sound.
Loudspeaker		A transducer which converts electrical energy to sound.
Piezo Transducer		A transducer which converts electrical energy to sound.
Amplifier (general symbol)		An amplifier circuit with one input. Really it is a block diagram symbol because it represents a circuit rather than just one component.
Aerial (Antenna)		A device which is designed to receive or transmit radio signals. It is also known as an antenna.

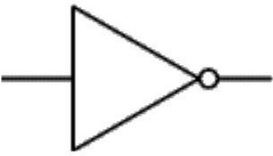
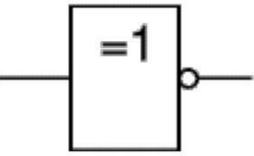
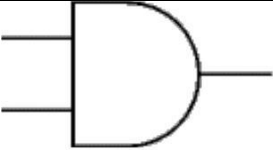
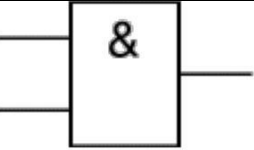
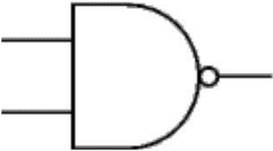
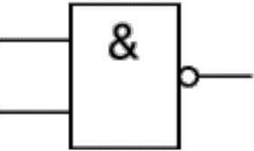
6. Meters and Oscilloscope

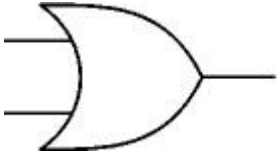
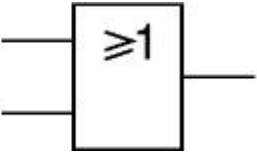
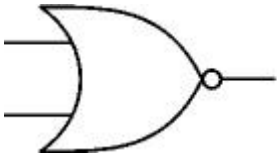
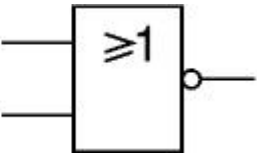
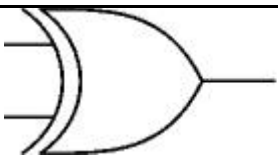
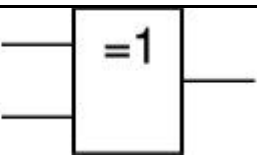
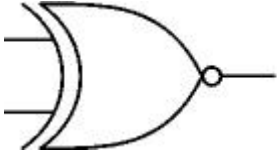
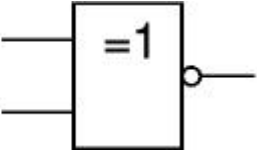
Component	Circuit Symbol	Function of Component
Voltmeter		A voltmeter is used to measure voltage. The proper name for voltage is 'potential difference', but most people prefer to say voltage.
Ammeter		An ammeter is used to measure current.
Galvanometer		A galvanometer is a very sensitive meter which is used to measure tiny currents, usually 1mA or less.
Ohmmeter		An ohmmeter is used to measure resistance. Most multimeters have an ohmmeter setting.
Oscilloscope		An oscilloscope is used to display the shape of electrical signals and it can be used to measure their voltage and time period.

7. Sensors (input devices)

Component	Circuit Symbol	Function of Component
LDR		A transducer which converts brightness (light) to resistance (an electrical property). LDR = Light Dependent Resistor
Thermistor		A transducer which converts temperature (heat) to resistance (an electrical property).

8. Logic Gates

Gate Type	Traditional Symbol	IEC Symbol	Function of Gate
NOT			A NOT gate can only have one input. The 'o' on the output means 'not'. The output of a NOT gate is the inverse (opposite) of its input, so the output is true when the input is false. A NOT gate is also called an inverter.
AND			An AND gate can have two or more inputs. The output of an AND gate is true when all its inputs are true.
NAND			A NAND gate can have two or more inputs. The 'o' on the output means 'not' showing that it is a <u>Not AND</u> gate. The output of a NAND gate is true unless all its inputs are true.

OR			An OR gate can have two or more inputs. The output of an OR gate is true when at least one of its inputs is true.
NOR			A NOR gate can have two or more inputs. The 'o' on the output means 'not' showing that it is a <u>Not OR</u> gate. The output of a NOR gate is true when none of its inputs are true.
EX-OR			An EX-OR gate can only have two inputs. The output of an EX-OR gate is true when its inputs are different (one true, one false).
EX-NOR			An EX-NOR gate can only have two inputs. The 'o' on the output means 'not' showing that it is a <u>Not EX-OR</u> gate. The output of an EX-NOR gate is true when its inputs are the same (both true or both false).

BASIC ELECTRONIC CIRCUIT TROUBLE IN APPLIANCES

- **Broken wiring inside cord set** - internal breaks in the conductors of cord sets or other connecting cords caused by flexing, pulling, or other long term abuse. This is one of the most common problems with vacuum cleaners which tend to be dragged around by their tails.
- **Bad internal connections** - broken wires, corroded or loosened terminals. Wires may break from vibration, corrosion, poor manufacturing, as well as thermal fatigue. The break may be in a heating element or other subassembly. In many cases, failure will be total as in when one of the AC line connections falls off. At other times, operation will be intermittent or erratic - or parts of the appliance will not function. For example, with a blow dryer, the heating element could open up but the fan may continue to run properly.
- **Short circuits** – When two wires touching or contacting the metal case of an appliance happens too often. Partially, this is due to the shoddy manufacturing quality of many small appliances like toaster ovens. These also have metal (mostly) cabinets and many metal interior parts with sharp edges which can readily eat through wire insulation due to repeated vibrations, heating and cooling cycles, and the like.
- **Worn, dirty, or broken switches or thermostat contacts** - These will result in erratic or no action when the switch is flipped or thermostat knob is turned. In many cases, the part will feel bad - it won't have that 'click' it had when new or may be hard to turn or flip. Often, however, operation will just be erratic - jiggling the switch or knob will make the motor or light go on or off, for example.
- **Gummed up lubrication, or worn or dry bearings** - Often, due to environmental conditions (dust, dirt, humidity) or just poor quality control during manufacture, a motor or fan bearing will gum up or become dry resulting in sluggish and/or noisy operation and overheating. In extreme cases, the bearing may seize resulting in a totally stopped motor. If not detected, this may result in a blown fuse (at the least) and possibly a burnt out motor from the overheating.
- **Broken or worn drive belts or gears** - rotating parts do not rotate or turn slowly or with little power even through the motor is revving its little head off. When the brush drive belt in an upright vacuum cleaner breaks, the results are obvious and the broken belt often falls to the ground (to be eaten by the dog or mistaken for a mouse tail. However, there are often other belts inside appliances which will result in less obvious consequences when they loosen with age or fail completely.
- **Broken parts** - plastic or metal castings, linkages, washers, and other 'doodads' are often not constructed quite the way they used to be. When any of these fail, they can bring a complicated appliance to its knees. Failure may be caused by normal wear and tear, improper use, accidents, or shoddy manufacturing.
- **Insect damage** - Many appliances make inviting homes for all sorts of multi- legged creatures. Evidence of their visits or extended stays will be obvious including frayed insulation, short circuits caused by bodily fluids or entire bodies, remains of food and droppings. Even the smallest ventilation hole can be a front door.

SIMPLE ELECTRONIC CIRCUIT REPAIR

- a. **Broken wiring inside cord set**
If the problem is intermittent, plug the appliance in and turn it on. Then try bending or pushing the wire toward the plug or appliance connector end to see if you can make the internal conductors touch at least momentarily. If the cord set is removable, test between ends with a continuity checker or multimeter on the low ohms scale. If it is not detachable, open the appliance to perform this test.

1 **Bad internal connections**

In many cases, a visual inspection with some careful flexing and prodding will reveal the location of the bad connection. If it is an intermittent, this may need to be done with a well insulated stick while the appliance is on and running. When all else fails, the use of a continuity checker or multimeter on the low ohms scale can identify broken connections which are not obviously wires visibly broken in two. For testing heating elements, use the multimeter as a continuity checker may not be sensitive enough since the element normally has some resistance.

2 **Short circuits**

Visually inspect for bare wires or wires with frayed or worn insulation touching metal parts, terminals they should not be connected to, or other wires. Use a multimeter on the high ohms scale to check between both prongs of the AC plug and any exposed metal parts. Try all positions of any power or selector switches. Any resistance measurement less than 100K ohms or so is cause for concern - and further checking. Also test between internal terminals and wires that should not be connected together.

3 **Worn, dirty, or broken switches or thermostat contacts**

Where there is a changed feel to the switch or thermostat with an associated operational problem, there is little doubt that the part is bad and must be replaced. Where this is not the case, label the connections to the switch or thermostat and then remove the wires. Use the continuity checker or ohmmeter across each set of contacts. They should be 0 ohms or open depending on the position of the switch or knob and nothing in between. In most cases, you should be able to obtain both readings. The exception is with respect to thermostats where room temperature is off one end of their range. Inability to make the contacts open or close or erratic intermediate resistances which are affected by tapping or jiggling are a sure sign of a bad set of contacts.

4 **Gummed up lubrication, or worn or dry bearings**

If the appliance does not run but there is a hum (AC line operated appliances) or runs sluggishly or with less power than you recall when new, lubrication problems are likely. With the appliance unplugged, check for free rotation of the motor(s). In general, the shaft sticking out of the motor itself should turn freely with very little resistance. If it is difficult to turn, the motor bearings themselves may need attention or the mechanism attached to the motor may be filled with crud. In most cases, a thorough cleaning to remove all the old dried up and contaminated oil or grease followed by relubing with similar oil or grease as appropriate will return the appliance to good health. Don't skimp on the disassembly - total cleaning will be best. Even the motor should be carefully removed and broken down to its component parts - end plates, rotor, and stator, brushes (if any) in order to properly clean and lubricate its bearings.

5 **Broken or worn drive belts or gears**

Except for the case of a vacuum cleaner where the belt is readily accessible, open the appliance. A good rubber belt will be perfectly elastic and will return to its relaxed length instantly when stretched by 25 percent and let go. It will not be cracked, shiny, hard, or brittle. A V-type belt should be dry (no oil coating), undamaged (not cracked, brittle, or frayed), and tight (it should deflect 1/4" to 1/2" when pressed firmly halfway between the pulleys).

6 **Broken parts**

In many cases, the problem will be obvious. Where it is not, some careful detective work - putting the various mechanisms through their paces - should reveal what is not functioning. Although replacement parts may be available, you can be sure that their cost will be excessive and improvisation may ultimately be the best approach to repair.

Carpentry and Masonry

TERMINOLOGIES

WOODWORKING

- 1. It is the skills developed by the students in terms of measuring, cutting, framing, joining and finishing wood materials
 - a. It is the art and a manner of cutting, forming and joining wood parts together
 - b. the art of shaping and assembling structural woodwork

CARPENTER

- a. A builder or a skilled craftsman who perform carpentry works

Wood

- b. Trees are the largest plant that grows in our forest and mountains have various types and species. They are group according to use and cut to form a lumber.
- c. Lumbers are classified as soft and hard woods cut and process and are sold in different sizes and length.
- d. Philippine Lumber are group in the following categories:

First Group	Second Group	Third Group	Fourth Group
This type of lumber is usually hard with fine grain. Each of this wood has different color in its sapwood. For furniture and cabinet making, woodcarving, musical instruments, interior	This second type of wood is moderately hard and heavy with fire grain. Usually this wood is for building construction, furniture making, shipbuilding and others.	The third group of wood is use for house construction floorings; furniture making and some are for charcoal making.	This group of wood is for cheap furniture, cabinets making, interior finishing and others.

finishing and other woodworks we use this kind of woods.			
1. Acle 2. lanete 3. Baticulin 4. Mancono 5. Betis 6. Molave 7. Kamagong 8. Narra 9. Ebony 10. Tindalo 11. Ipil 12. Yacal	1. Banuyo 2. Guijo 3. Bolongeta 4. Palomaria 5. Calantas 6. Teak	1. Amugis 2. Apitong 3. Tangile	1. Lauan 2. Almon 3. Bagtican 4. Dao

CLASSIFICATION, DESCRIPTION AND MEASUREMENT OF

LUMBER *Lumbers are sold following the description:*

- a. Surfaced two side or S2S
- b. Surfaced four side or S4S
- c. Surfaced in two side and one edge or S3S
- d. Kiln dried or K.D.
- e. Rough lumber with specific measurement
- f. Tongue and groove T & G
- g. Board measure R.M.
- h. All widths and length AW and AL

Measurement of lumber is specified according to its length, thickness and width. The common unit of measure for lumber is in "board foot"

Example: 1" thick and 12" width and 12" long are equals to 1 board foot. In buying the lumber the computation is done by the number of board foot not by the number of pieces you will buy.

Basic consideration on the quality of work done

- 1. Quality of wood selected
 - a) The design of the project
 - b) The skill and basic processes involved in making the project

Basic Wood Technology and Masonry

1. Wood preparation for future use

The proper way of preparing wood for future use is by means of seasoning. It is the drying period of wood. The time when moisture evaporates from the wood cells after the wood are cut into lumbers. Shrinkage of wood is the time when the drying of fiber has "each saturation point due to evaporation. The most common way of wood preparation is as follows

- 1.2. **Air seasoning**
It is the process of filling the lumber carefully in open air in order to allow free circulation of air around a piece of wood in a specified period.
- 1.3. **Kiln seasoning/ drying**
It is the specific way seasoning lumbers. It uses oven to dry lumbers to have quick drying and lowering of wood moisture content.

2. FINISHING

After all the project is assemble, the next step is to prepare the object for finishing. Before applying varnish or paint in the project for final phase of your work, the following tools and materials needed to facilitate your work.

- 2.1. **Scraper**
Scraper is tool made of steel. It is manipulated by pushing or pulling in a direction following the grain of the wood surface after such wood has been planed to produce a very smooth surface.
- 2.2. **Sand Paper**
This is use to smoothen the surface of the wood. There are two types of sand paper. They are the wet and dry sand paper.
 - 1. Dry Sand Paper has abrasive material glued to the surface of the paper that is soluble to water. This is usually for wooden project.
 - 2. Wet Sand Paper uses waterproof glue. This is used in floor sand ling which uses water to facilitate effective scratching and smoothing.
- 2.3. **Wood Fillers**
Wood Fillers comes in natural color. This are used to eliminate deep cuts and holes in your finished project, so that surface can be made even and smooth. Filler should be applied in your project before applying wood strain.
- 2.4. **Stain**

It is a wood finishing material. The stain is derived from different color of woods such as walnut, mahogany and natural color. Stain is sold in can or bottles and they are classified in the following:

Oil Stain

1. Water Stain
2. Spirit Stain

Before applying a stain in your project, make sure that the surface are free from excess glue, tool mark and grease to produce good result.

A finishing material came from gums substance of insects. Alcohol is used to dissolve the gum in a ratio of three kilos to a gallon of alcohol. There are two kinds of shellac use in finishing. They are as follows:

Orange Shellac – natural type

White Shellac – are produced by bleaching

A finishing material when applied produces high glossy finish to a project. It came in different forms, from gum, linseed oil, resin, turpentine and or chemical drier. They are sold in can or gallon size bottles. Varnish is durable, transparent and tough when applied on the surface on the project.

Paint is the most widely use in finishing a project or object. It is being prepared in different pigment materials of chemical. Each of this type of paint has different materials and characteristics for a specific used.

Types of Paints

1. Latex Paint
2. Enamel Paint
3. Lacquer Paint

COMMON WOOD JOINT

Joinery is the process of putting the work together depending on what kind of project or object of wood you are making. A good joint is a matter of accurate lying out and cutting wood o produce a neat and strong joint. The following are some of the most common wood joint.

1. Dado joint

A dado is a groove that runs on board and receives the end or edge of the second board. It is commonly use for making cabinetwork.

2. Rabbet joint

It is wood joint commonly used for making frames to hold glass in constructing drawers and other cabinetwork. A rabbet is a groove running along the grain while dado is across the grain.

3. Mortise and Tenon

It is the strongest kind of wood joint used in fastening piece of wood together. The joint is considered the best in cabinet making for it provides good reinforcement.

4. Miter joint

This type of joint uses 45 degrees angle cut. This is usually intended for making frames because of the neatness in appearance.

5. Lap joint

This type of joint is use for reinforcing wood length. The wood assembly is overlapping each other.

6. Butt joint

This is simplest type of wood joint where in two pieces of wood are nailed in one end

Measuring, Marking and Testing Tools

Folded Wooden Rule

This is are made of 2 to 3 feet long but have joints in order that they can be folded up to fit in the working jacket. It has in inches and fractions of an inch so that it can be use for measuring a wood stock.

Ruler

It is a manageable tool use for measuring small project or articles. The measurement calibrated in inches and centimeter.

Push Full Steel Tape Rule

The steel tape is assembled in a fixed casing and retracts automatically by spring. It is made of steel tape 3/8ll to 5/8ll wide and graduated in feet, and fraction of an inch on one side and centimeter in the other side.

Try Square

This tool is use for testing one surface and square ness to another. It is also use for working out lines, which must be square to the edge of the wood across the grain at about 90 degrees.

Sliding T Bevel

This tool can be set to any angle. This is use to test the slope of a beveled edge. It is also use for working on a wood out of straight line and right angle to the edge of the wood.

Marking Gauge

This tool is for making lines parallel to the edge or end of a piece of wood. A rile is used to set the size to be measured. If gauge is set to its size, mark and slide the gauge to the stock along the stem.

Knife

The tool is be classified as cutting or marking tool. It can mark layout to a wood stick.

Dividers

It has two legs jointed together at the top and is pointed at both ends. One wing is use to set the desired distance of the legs point and the other wing is screw at the end of the spring, which is used for fine adjustment of the legs.

Scriber

The tool is designed for marking wood or metal. It has two (2) ends, one straight and one angled at 90 degrees, to mark hard to reach part of wood.

Sliding T-Bevel

It has three (3) main parts: the beam or handle and the thumbscrew. The angle of the T – Bevel can be set to any angle, and put in place by tightening the thumbscrew. It can be used to test bevel or transfer an angle of one piece of lumber to another.

Scratch Awl

The tools like an ice pick, it is used for making and for punching the location of holes that are to be drilled.

WOODWORKING MACHINE AND THEIR USES

C-Clamp

It is made of steel formed like letter C, designed to hold small pieces of wood. It can apply pressure at point not accessible to the other clamp for holding work and to bench. The size is mark to the body and it measured according to the distance it can open. For efficient performance of the equipment, the thread of the clamp should be lubricated with oil regularly.

Hand Screw Clamp

The jaws are made of wood with two hand-operated screws. It can hold flat blocks or irregular shape objects. The hand-operated screw should always be equal in distance in order not to deform the edge or the jaw of the clamp.

Bar Clamp

The bar clamp that has the longest span compare to other clamp. It is used to hold glue edge joint in wide pieces such as tabletop and doors with a usual length of six feet. The bar clamp should kept in a proper flatness to avoid deformation of the clamp itself. Oiling the parts should be a part of maintaining the efficiency of the clamp.

Miter and Corner Clamp

It is used to give edge joint of miter corner such as picture frame. The maximum opening is three inches.

Woodworking Bench Vise

It is woodworking equipment attached to the bench, designed to hold number to be process. The movable jaw can open up to 12 inches. Cleaning the thread and jaw is the basic maintenance of the vise to attain efficient performance.

Portable Electric Drill

This equipment is use for boring holes with a desired size using drill bit. This type of tool needs regular maintenance to prolong life of the drill.

Wood Lathe Machine

An equipment use to form wood by mean of turning. This machine is use for mass production of wood products. Care and maintenance of the machine should always be the main concern of the operator to avoid accident. Using this machine need a lot of training and guidance of the teacher in order to produce quality products in woodworking.

Electric Planer

This equipment use electricity to plane pieces of wood for mass production. To avoid accident, the user should follow extra care.

Circular Saw

A machine used for cutting woods into lumber. It uses electric motor to operate the machine. Appropriate skills training are needed in handling the machine to avoid accident.

CUTTING TOOLS

Woodworking cutting tools are classified according to its uses. The following are types of cutting tools; saws, planes, chisels, gauges and boring tools. Proper care and handling of these kinds of tools should be in outmost care to avoid accident.

CLASSIFICATION OF SAW ACCORDING TO USE

There are several kinds of saws designed and fitted for a specific job. They are as follows:

Rip Saw

This kind of saw is use for cutting woods along the grain. The tooth of this saw is sharpened similar to the chisel. The kerfs are the cut slightly wider than the blade of the saw. The purpose of which is to give enough clearance for the blade to slide in and out during cutting.

Cross Saw

This is designed and use for cutting stock of wood across the grain. The teeth of this saw similar to the chisel when sharpened. The kerfs are the slightly wider saw cut of the blade on the stock. The purpose of which is to give enough clearance for the blade to slide in and out during cutting.

Back Saw

This saw is use for line cutting especially in making wood joint. This kind of saw can cut across the grain of the wood. The saw is thin and length usually ranges from 20, 32, to 45.2 cm.

Coping Saw

This tool is designed for cutting irregular shape and curves on thin pieces of wood. It is easy to use for cutting because of its fine blade.

Key Hole or Compass Saw

This saw has a long narrow blade with handle that operate short stroke at the start. It is use for cutting irregular and circle shape in a wood. This type of saw is also used if the coping saw is impossible to use.

CLASSIFICATIONS OF PLANES ACCORDING TO USE

Planes are use primarily for the purpose of to make the wood surface smooth and square to specified measurements after measuring and sawing process is done.

Jack Plane

This type of plane is use for both rough and temporary planning. It is also use for general purpose, which has a measurement of about 29.2 cm, to 35.6 cm length.

Jointer Plane

The measurement of this plane is 55.9 to 60 cm. long. This is use for smoothing top surface like desk, table and edges of boards.

Smooth Plane

This plane is use for finishing fine work and smoothing small pieces of wood. The size of this plane is usually 15.2 cm to 24.5 cm long.

Spoke Shaves

This plane is use for smoothing outside curves. It has handle in both side and small cutting blade. The tool can be operated along the grain of the wood.

CLASSIFICATION OF CHISELS ACCORDING TO USE

The main purpose of this tool is for shaping and cutting wood. It has a wooden handle fitted with a ring of metal called ferrule. The main purpose of this ring is to stop the handle from splitting when the tang is forced in. chisels come in different shape, they are.

TYPES CHISELS *Firmer Chisel Paring Chisel Mortise Chisel Butt Chisel*

- It is use for both heavy and light works in woodworking. It has a plain straight or strong beveled blade.

- It is used for working on a very small space to work. It is also use for hand chiseling extra fine work.

This kind of chisel has a long their blade.

-This chisel is use for cleaning and shaving out chips especially in making mortise joint.

- This chisel is use in places where larger kind of chisel is impossible to use. This type of chisel is short as compared to other chisel.

TYPES OF GOUGES

This tool is like a chisel but the cutting edge is curve in shapes. The curved edge varies in shape from rounded to almost straight edge.

Scribing Gouges - For cutting inside curve, we use this type of gauge. The cutting edge is bevel ground on the inside.

Firmer or Carving Gouges

When making a wooden bowl, we use this type of gouge. The cutting edge is beveled ground on the inside.

CLASSIFICATION OF BORING TOOLS

An activity in woodworking needs some boring operations in the process of assembly to insure proper quality of workmanship. Any activity in making article or project, boring process may be use for the purpose. The following are some of the boring tools used in woodworking.

Auger Bits

These tools are used for boring holes in wood. It has different sizes for specific hole.

Expansive bit

A type of boring tool attachment to the auger brace use for boring holes on wood of more than 2.5 centimeter diameter.

Brace - It is use for holding bits when boring hole on a wood.

Hand Drill - These tools are used for boring hole with drill bet not more than ¼ inch in diameter.

Bradawl - This tool consists of a handle and a long tapered blade with a wedge or chisel point. Particularly this tool is use for making small holes in wood for screws and nails.

Electric Drill - This tool is electrically operated, it is use to bore hole with a desired size using drill bit. This tool needs regular maintenance to prolong the life of the drill.

DRIVING TOOLS

Driving tools are used for assembly of woodworks and any purpose that may serve it. It is commonly use for driving nails. Using holding tools can facilitate the assembly of any woodwork activities.

CLASSIFICATION OF HAMMERS

Claw Hammer

-The tool is made tool steel with wooden handle. The main purpose of this hammer is to drive nail. The claw is used for pulling out nails.

Mallet

-This tool is made of wood. To prevent the handle of the chisel from breaking we use this type of tools.

The head has a tapered slot that prevents the head from flying off when in

Measurement and Layout

The beauty, neatness and accuracy of work depend much on correct measurement and layout in materials. Woodworking follows the principle of measuring object twice to justify accuracy and cutting of materials once. This way waste of materials is avoided. The proper use of measuring tools and correct lying out of work contribute a lot in skills development especially in project making.

Layout of Project

In every carpentry and masonry activity like constructing a house or project making, plan should to be followed to maximize the use of material. Proper layout of project contributes a lot in the economy of materials and good result of the project.

Procedure in Constructing Woodwork and Masonry

Laying Out the Foundations and Post of a Building

Getting acquainted with different parts sections and components of a house, you can start with the first step in constructing a building which is to lay out the building site.

This is the process of locating the area where the foundations of the building are to stand, which means accurately locating the four corners of the building that in turn will establish the boundaries of the foundation, no matter what type of foundation you use. Follow these steps in laying out a building.

1. Establish the orientation line. This represents one side of the building to be erected whether the building is in line with existing building. Parallel to the road, parallel to existing building or the building is going north to south, east to west, or in any to the north-south direction.
2. Stake out the corners temporarily. To give an idea of how the building will sit on the lot and to have a basis for erecting the batter boards.
3. Set up a batter or reference boards. Use any of the two types of batter boards, the batter boards for foundation posts which may be either joined continuous pieces surrounding the site of the foundation or individual piece for each of the foundation and batter boards for foundation walls
4. Lay the sides of the building on the batter boards. This is done by making
line representing the outer side of the foundation,
line representing the true length of the sides of the proposed building,
line representing the side of the building from center to center of the foundations.
5. Square the layout lines. There are ways to do this a) by using the framing square, b) by using a right triangle with sides of 3:4:5 ratio and c) by measuring the diagonals which the most accurate.
6. Locate the areas for the foundations by determining the location of the foundations and by measuring distances from center to center between the foundations on the layout lines.
7. Mark the areas for excavations needed for the foundations. You need a plumb bob for this purpose by hanging passing through the intersection of the foundation lines and a template representing the size of the footing if several diggings are to be made.

Tools and Devices in Laying Out Foundations of a Building

1. Framing Square – made from a single piece of steel bent to form a right angle. The tongue is usually 16 inches long and 1 ½ inches wide. The blade is 24 inches long and 2 inches wide.
2. Line Level –only a couple of inches long and has hooks at each end so that it can be hung on a piece of string. It gives you a close approximation on long reaches especially when laying out the strings for a foundation.
3. Water and Tube Level – Compose of Water container filled with water, nipple, rubber hose and glass tube with graduations. Use to establish level marks for laying out foundations, girders, horizontal studs and girt plates. An application of the principle that seeks its own level.
4. Transparent Water Hose – This is similar to the principle applied in water and tube level.
5. Plumb Bob – is designed to hang from a length of string to give a true vertical. It is widely use for locating the corners of a foundation.

Laying Out Column Footing and Wall Footing

Footing is the widened base of a foundation post or wall. It prevents the foundation from sinking under its heavy load. Footing is made wider and thicker when the earth under it is soft, clay or sandy and may require forms to get even thickness and width.

However, footings standing on rock may use the sides of the diggings as forms. The depth of the footings may vary depending on the height of the building and the soil where the building is erected. Remember that the strength of the building relies on the strength of the foundation. It must withstand the wreath of typhoons and the intensities of earthquakes.

Erecting and Aligning Post

After the concrete foundations have been hardened posts can erected and aligned as well. This should not be too soon, or the column will break from the footing. It is advisable to erect the post with the forms and braces still intact. Foundation posts are anchored with iron straps and bolts in alternate directions so that the strong side of one post will support the weakness of the other. Follow these steps:

- A. Square off the ends of the post.
- B. Be sure the post will enter the strap. Otherwise, chisel the area for the strap.
- C. Nail pivoting braces on the four sides of the post.
- D. Erect the post. Use the braces for pushing, pulling and steadying the post.
- E. Center the post to the foundation.
- F. Drive stakes to anchor the braces.
- G. Check the vertical ness on both sides of the post simultaneously by a plumb bob.
- H. Nail the braces to the anchor stakes.
- I. Drive one nail on each sides of the strap and then bend it towards the strap.

Bore holes from the strap and insert the bolts with the nuts tightened. Do not forget the washers. Boring is done on both sides letting these holes to meet at the middle of

Proper Mixing in Masonry

At present, concrete is one of the economical and most durable building materials known.

1. It is the proportioned mixture of Portland cement, sand, gravel and water. In its wet or plastic stage
 2. It can be molded or cast to any desired shape. This mixture becomes as hard as stone when it dries up.
 3. Concrete gradually attains its strength, and it needs water for proper hardening.
 4. It needs curing for 3 to 14 days after it had been poured.
 5. Proper handling of materials, correct mixing and pouring of concrete and sufficient curing contribute to the quality of work. Using concrete as your material makes the structure permanent. It cannot be recycled as when using wood.
-
1. Cement – Portland cement is used for concrete. This is not a trademark but a name that distinguishes it from cements used for other purposes. It's hydraulic cement made by heating and pulverizing a mixture of limestone and clay. When mixed with water, it acts as bonding material for the aggregate. It weighs 94 pounds, approximately one cubic foot and sold per bag.
 2. Sand (Fine Aggregate) – Sand acts as filler between the spaces in the coarse aggregates. River bank sand and screenings from crushed stones are suitable as fine aggregates but seashore sand is not applicable for concrete because it contains a chemical which weakens bonding of the cement. Sand should be clean, and hard. It should be free from clay, loam dust or any dirt. These will also add to poor bonding and eventually weakens the concrete. However, dirty sand can be washed by means of chutes.
 3. Coarse Aggregate – These are gravel, crushed stone, and pebbles which should clean and hard. The sizes of gravel depend on the job like for foundations, it needs bigger sizes but for walls and floors it requires smaller gravel. It is important that the gravel could pass readily between the reinforcement and the form.
 4. Water – The water to be used must clean free from mud, oil, alkali and other matters.

The amount of water used in mixing concrete is the most important factor affecting the strength of a given mixture after it is ascertained that the cement and aggregates possess all the good qualities. Too much water will reduce the strength of the concrete by as much as 25% to 50%. There is no specific amount of water depending on the moisture content of the aggregates. The volume of cement, sand and gravel is measured with the desired proportion expressed in three numbers, for example 1:2:4 respectively. Different proportions of concrete have different hardness and porosity. Always refer to the specifications for mixing proportions to attain quality concrete. The following are samples of mixing proportions which may serve as your guide.

4. Class AA – 1:1 ½:3. Used for columns of reinforced concrete buildings and for construction where a very strong, dense concrete is required.
5. Class A – 1:2:4. Good mixture for reinforced concrete works of all kinds and for general concrete work.
6. Class B – 1:2 ½:5. Medium mixture for plain concrete, walls, floors and other purposes which do not require so much strength and impenetrability.
7. Class C - 1:3:6. Lean mixture used in heavy masses where the loads are wholly compressive and of moderate intensity and where the main requirements are weight and stability combined with moderate strength, as in heavy walls and in foundations for bridge piers.

Mixed concrete should be poured before the initial setting takes place and this within 30 minutes after mixing. It should be properly handled so the aggregates will not separate. After the mixed concrete is poured in its proper place, let it set. This is the chemical process of concrete hardening. During this process, the concrete should not be disturbed.

Tools and Equipment for Hand Mixing

1. Spade or Square-pointed Shovel – it can easily dig the aggregates at the bottom of the mixing platform
2. Measuring box - one cubic foot is preferred
3. Mixing Platform – where the cement, sand, gravel and water is mixed.
4. Water container – and container that can serve the purpose.
5. Wheelbarrow – used to transport aggregates

1. trowel
2. float (wooden or steel)
3. plumb level, sponge
4. and hacksaw.

1. Measure the amount of sand for the proportion
2. Spread the cement on top of the sand.
3. Mix thoroughly the sand and cement with a spade. Make sure the mixture has uniform color.
4. Pile up the mixture and bore a hole at the center.
5. Measure the amount of water and pour slowly into this hole to give time to sink.
6. Measure the amount of gravel needed and spread it evenly on top of the mixture.
7. Turn the mixture until the gravel is uniformly distributed and thoroughly coated with sand and cement.

Formula in Finding the Quantity of Cement, Sand, and Gravel

The amount of cement, sand and gravel will depend on the kind of mixture you want to produce.

1. Find the volume of the concrete in cubic feet.
2. One cubic foot of gravel is equal to 95% of the volume of the concrete.
3. Bags of cement = Cubic feet of gravel

1. Cubic feet of sand = cubic feet of gravel

Focus: Plumbing
Drainage system

Water disposal after use becomes a problem in the drainage system if it's not working correctly. The house drainage system does the job for the purpose of disposing and draining water carrying away solid wastes. Drainage system including proper installation venting system of the sewer gases to facilitate the flow and draining of water waste.

It's commonly called the “**drain-waste-vent,” or DWV system.**)

1. The major importance in the DWV system are the traps, the familiar U or S-shaped bends of piping under sink.
2. Traps are designed to prevent potentially dangerous sewer gases from entering the house; each fixture must have one.
3. The shape and position of a trap, under normal circumstances, retains water that serves as an effective seal against rising sewer gases.
4. The drainpipes themselves lead away from all fixtures at a certain calculated slope.
5. If the slope is too steep, water will run off too fast, leaving solid particles behind
6. If it's not steep enough, water and waste will drain too slowly and stay into the fixture. The normal pitch is ¼ inch for every horizontal foot pipe travel.
7. Central to the DWV system is a soil stack, a vertical section of 3 or 4-inch-diameter pipe that carries waste away from toilets (and often fixtures) and connects with the main house drain in the basement or crawl space.
8. The upper part of the stack serves as a vent. Secondary vents from other fixtures can also be connected to it above the level of the highest fixture in the house (this is called reventing or back venting).
9. However, in many houses – especially single-story house – widely separated fixtures make it impractical to use only one stack. Instead, each fixture or fixture group has its own waste connection and its own vent.
10. The house drain is 3-inch, 4-inch or larger diameter pipe that collects all waste and drainage from the soil stack and other drainpipes and leads out of the house where it joins the house sewer – the underground part of the drainage system.
11. Cleanouts provide access to the pipes for clearing obstructions. Cleanouts should be installed in various places in the drainage system
12. There should be one cleanout in each horizontal section of drainage line, including an outdoor cleanout for access to the house sewer.

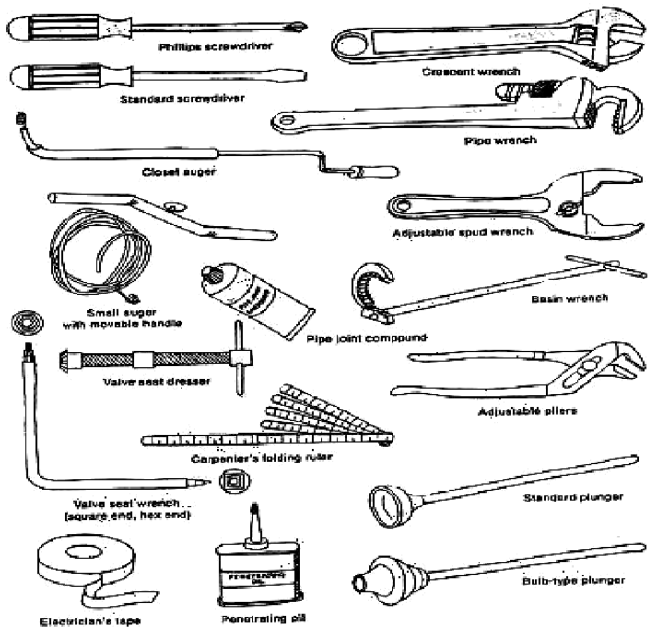
Tools used in Plumbing

Types of Wrench

1. Pipe Wrench
2. Adjustable wrench
3. Valve seat wrench (square end, hex end)
4. Basin wrench

Other tools

1. Standard plunger, Bulb type plunger,
2. Pipe Cutter
3. Screw driver
4. Closet auger
5. Valve seal dresser
6. Pliers
7. Small auger with movable handle



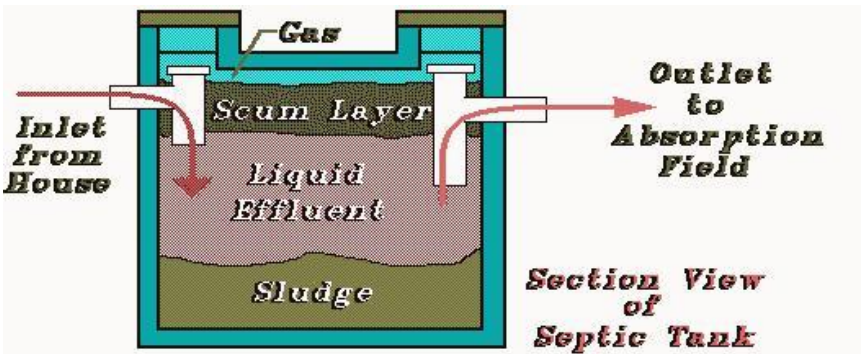
Theories of House Plumbing and their Application in Septic Tank, Bathrooms and Kitchen Water Connections

SEPTIC TANK

Venting system

Sewer gases can build up enough pressure in your drainage that break through the water through the water seal in a trap and enter your house through a drain. The venting system prevents above the roof of your house.

The venting system also maintains atmospheric pressure in the drainpipes. Water running out through traps can create vacuums, causing a siphoning effect that would empty the traps of water.



The constant presence of the circulating air throughout the drainage system maintains an equilibrium that prevents siphoning. All fixtures must be vented. Each may have its own vent or may connect with a main vent through a system of secondary pipes.

Plastics

A comprehensive range of both mechanical and injection-molded fittings is produced to suit plastic pipe manufactured from the rigid **PVC, polyethylene and nylon materials**. These materials belong to the —thermoplasticll classification of plastics and are mainly used in a range of sizes from 15 to 50 mm only a limited range of screwed fittings is available.

The Unplasticised polyethylene Chloride **uPVC** system offers possibly the greatest range of screwed plastics fittings well suited to domestic, commercial and industrial applications.

Majority of jointing in this system is based on the solvent weld spigot and socket technique, many joint are of the screwed type and are used in a similar manner to that used for steel pipes.

Moulded solvent-weld uPVC pressure fittings are manufactured and tested in accordance with an Australian Standard and are classified in various BSP threaded fittings are available for take off connections. The spigot and socket ends are connected in the usual way using solvent cement.

To connect threaded fittings, the joint is best made by using PTFE sealing tape onto the male end and screwing firmly, avoiding over tightening. Various uPVC adaptors and other moulded threaded fittings of the system.

Polyethylene (black polythene)

The greatest demand for fitting associated with polyethylene pipe is still in the rural sector for water reticulation systems for some reasons like:

Polyethylene pipe cannot be solvent bonded; the greatest usage for mechanical fittings is in conjunction with fittings produced from this material. A complete range of BSP fittings is available to suit polyethylene, PVC and galvanized steel pipes and fittings.

The normal method of joining polyethylene pipe is by compression (non-manipulative) fittings while the extensive variety of fittings available to suit the various grades of pipe makes reference to the fitting instructions provided by manufactures advisable, because particular brands use different rings and inserts.

A relatively recent development in mechanical fittings is available and is suitable for joining both imperial and metric sizes of medium and high density polyethylene pipe. It is made from a nylon material and the basic component of each fitting is known as —central fittingll. A special insert housing an O-ring is provided and fits into the central fitting. The joint is achieved by screwing up a coupling nut onto the central fitting.

Flanged Joints

Flanged joints are generally used on large-diameter pipes and tubes where unions and other screwed fittings prove to be impartibly.

Flanged joints have the advantage of allowing sections of piping to be removed or replaced without distributing any other section of the piping circuit

Valves

- 1. Flanged valves are normally suppliedunbridled. If they are to be drilled they must be made according to relevant Standards table.
- 2. Valves are to be drilled to a specific template; the position of the holes relative to the centre line of the spindle must be clearly indicated.

Cast iron pipe and fittings

- 1. Flanged cast iron pipes are produced primarily for water main systems.
- 2. The flanges are catch/grasp/grip integrally with the pipe barrels and the joints are made by bolting – as with other flanged systems.
- 3. Suitable flanged fittings are available to match the pipe ends. Flanges used in water service pipe work all conform to an Australian Standard.

Other flanges

Oval flanges are available in the galvanized malleable cast iron but are not intended for pressure purposes.

Flanged PVC joints are made in a similar manner as that for steel pipes. The flanges may be joined to the PVC pipe in two ways.

- 1. Solvent cementing, as foe fittings and straight pipes.
- 2. Hot gas welding using PVC filter rod.

Handling Flanges

Care should be exercised at all times when handling flanges.



Fig. 5.56 Oval flange

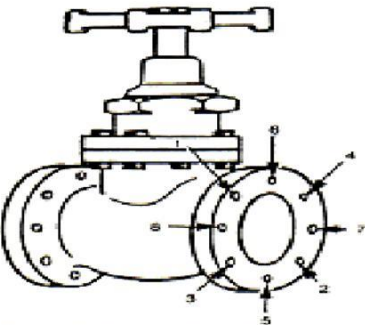
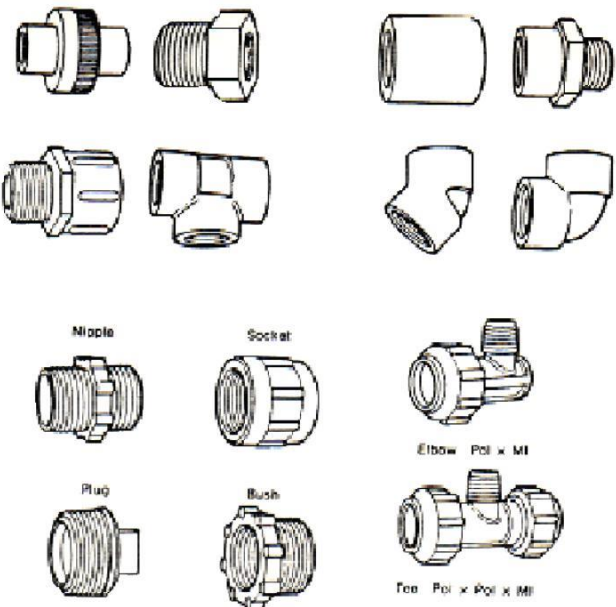


Fig. 5.57 Sequence for tightening bolts



1. They should be protected against damage to their faces from such things as score marks and weld spatter, and should be free from cracks and surface flaws.
2. Flange faces and sealing gaskets should be coated with approved compounds. When tightening flanged valve bolts a —crossoverll method should be used.
3. Uniform pull on bolts reduces stress on the flange and other parts of the valve.
4. Both threads should always be lubricated as lubricant reduces friction between the threads and protects them from rust and corrosion.
5. Joints pull up tighter and are pulled apart more easily when lubricant is used.

Sealants

Sealants, within the context of this section, refer to the polymeric range and include those sealants made from natural rubber and the various synthetic elastomers. Polymeric sealants are formulated to provide a continuous- surface polymer bonding layer to both opposing surfaces to fill (seal) a gap to set (cure) by polymerization.

3. Part of their sealing function are designed to hold metal sections together, they will always require some of mechanical aid (fasteners) such as rivets or screw.
4. It is important to realize that sealants are not to be confused with adhesive. Joints are usually subject to some form of movement because the overlapping surfaces expand and contract with temperature changes.
3. Sealants must therefore allow for this movement by curing flexible elastic material and by remaining soft.
4. Approved silicone sealants cure on contact with air to form permanent, flexible silicone rubber which is very durable and is unaffected by aggressive weathering elements such sunlight, moisture and extremes of temperature.

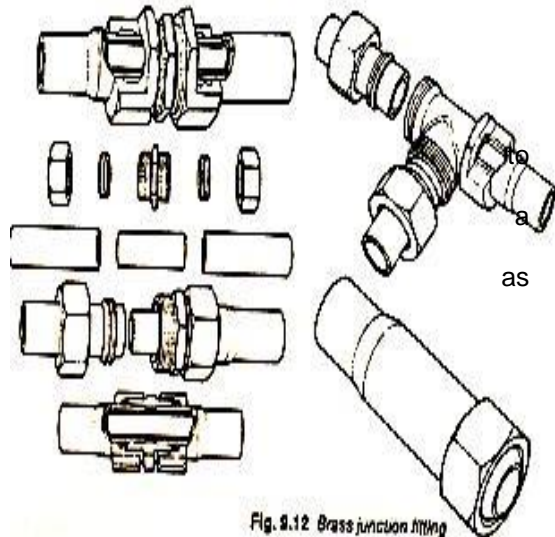


Fig. 9.12 Brass junction fitting

Recommended properties

Sealants used in conjunctions with metal roofing sections, flashings, guttering and rainwater accessories should posses all of the requirements listed below.

1. Flexibility
2. Water resistance
3. Corrosion resistance
4. Mould resistance
5. Resistance to ultraviolet radiation
6. Resistance to temperature extremes
7. Gap filling (no slumping)

Where doubt exists on the sustainability of a particular sealant, the following list of properties should be used as a basis for selection.

Stainless steel tube

Stainless steel tube is one of the most corrosion- resistant materials available to plumbers for use in hot and cold water services.

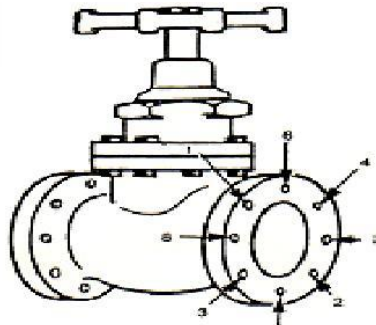
1. This is due to the resistance of the hard, adherent and transparent oxide film which covers the surface of the tube.
2. Stainless steel tube is stringer than copper and steel and weighs less. The rigidity of the tube is an advantage when fixing, as is the expansion rate of stainless steel tube which is less that copper's, resulting in less movement in fixing and less strain on joints.
3. The tube of fully compatible with copper or copper fittings; no galvanic or electrolytic action occurs.

Fixings

The coefficient of polyethylene is high; the material should therefore be free to expand and contract wherever it is fitted, as with uPVC pipe. Polyethylene does not have anywhere near the rigidity of uPVC. Because of this, the material is restricted in use particularly above the ground and in hot areas. For suspended supports, this pipe should be laid in structural channels or angle sections, as allowable spans of only eight to twelve times the pipe diameter are required to prevent sagging.

Valves taps and controls

The range of valves, taps and controls used in water supply work is immense. Each has been designed for a specific purpose and therefore the materials form which they are manufactured also varies considerably. Found only on domestic installation.



A Valve is a hand-operated device used to control the flow of water in a piping system. It is manufactured from bronze, brass, gunmetal, steel, cast iron, glass or plastics or a combination of these. Materials with high corrosive resistance are usually used on water supply.

A tap is also a hand-operated device used to control the flow of water in a piping system. A tap may or may not be manufactured with both inlet and outlet threads. Unlike a valve it is designed to be installed on an outlet of a pipeline and the type of appliance water outlets dictates of the tap.

Groups of valves and taps

There are several groups of valves in common use in water supply.

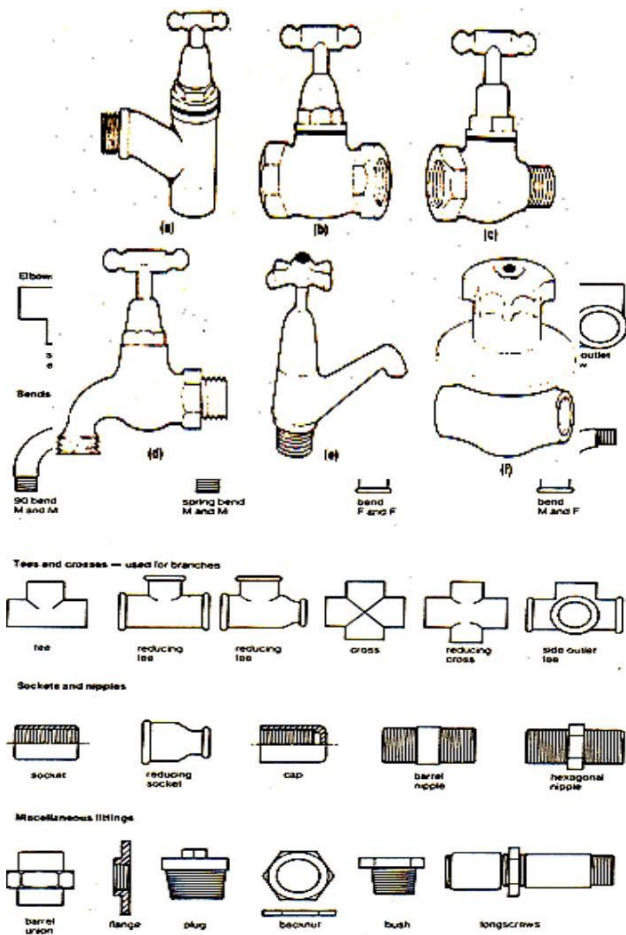
They are:

- 1. loose valve screw-down type;
- 2. straight through screw-down type;
- 3. ground face plug type

Loose valve-screw down type

These are most commonly used controls on reticulated water supplies and there are many different shapes in both valve and taps which incorporate the same operating principle.

- 3. The spindle is raised by turning the handle in the counter-clockwise direction, pressure is released from the valve and the water pressure acting on the underside is then able to lift the valve and allow the water to pass through to the outlet.
- 4. Water is restricted to the body section by a rubber O ring fitted on the bottom of the spindle. This O ring forms an effective seal between the spindle and the bonnet of the valve and prevents water passing out of the tap via the bonnet.



- 1. Some valves and taps are not fitted with O rings but have a stuffing box which retains a graphite-impregnated asbestos gland which serves the same purpose
- 2. All loose valve taps and valves have, as their name implies, a loose valve to shut off the water supply. This loose valve allows the water to flow through in one direction only.
- 3. Therefore it is necessary to install this valve so that the incoming water lifts the valve from the beneath.

Follow the correct installation techniques and steps in plumbing

Plumbing systems

The plumbing connection consists of the following:

- (a) Light-gauge copper tube
- (b) Capillary fittings are suitable for the transmissions of hot and cold water, gas, compressed air and other fluids.
- (c) Capillary fittings are designed to give good flow characteristics which are easily taken apart and are cheaper and less bulky than compression fittings.

Joining of polyethylene

Because of the comparison of polyethylene, no effective commercial solvent has yet been developed that will dissolve or fuse it.

- 10. Solvent joints as used with uPVC are therefore not possible. Jointing is carried out by means of welding or the use of brass compression fittings.
- 11. Welding is carried out in the manner as with uPVC, with the same advantages and disadvantages
- 12. Compressions fittings, normally constructed of brass in various sizes, are manufactured for jointing polyethylene

Joint design

Seams should always be mechanically fastened for strength, whether soft soldered or sealed with a compound sealant. The sealant does not, therefore, require significant adhesive strength but must bond positively to both opposing surfaces as a continuous layer.

- Meters are often in position where the inlet and outlet rises are to be encased in concrete.

- When this occurs, the removal of the meter for servicing or cleaning is extremely difficult
- As the meter rises to rigid, the deflection of the pipe work effect the removal of the meter and it may cause fracture to the pipe
- To eliminate the possibility of damaging meters, meter unions or pipe work, an additional bend should be installed on the meter outlet riser so that the pipe work may be swung aside and the meter removed.

The procedure for making the joint is as follows:

- Cut the pipe ends square and remove burrs.
- Place the coupling nut over the pipe end.
- Fit the insert into the end of the pipe.
- Push the complete and assembly into the central fitting.
- Tighten the coupling nut firmly with a wrench, but avoid over tightening.

REPUBLIC ACT NO. 6541 NATIONAL BUILDING CODE OF THE PHILIPPINES
Chapter 5.02 – SANITATION SECTION 5.02.01:

General

□ All buildings hereafter erected for human habitation should be provided with plumbing facilities installed in conformity with the National Plumbing Code adopted and promulgated by the National Master Plumbers Association of the Philippines pursuant to Republic Act 1378, otherwise known as the "Plumbing Law".

The importance of the Standard National Plumbing

Codes The purposes of plumbing codes are to:

Establish standards that will protect the health of the community. Faulty plumbing is a serious health hazard. Codes have always varied widely from place to place.

With the increasing standardization of equipment and materials, plumbing codes in different areas of the country are tending more and more toward uniformly,

There is by no means a single plumbing code. Organizations are at work encouraging the adoption of a uniform, nationwide plumbing code.

Most obvious variations in code have to do with climate-pipes in underground (to prevent freezing).

Plastic piping, still a relative new comer in the industry, is not accepted uniformly throughout the country.

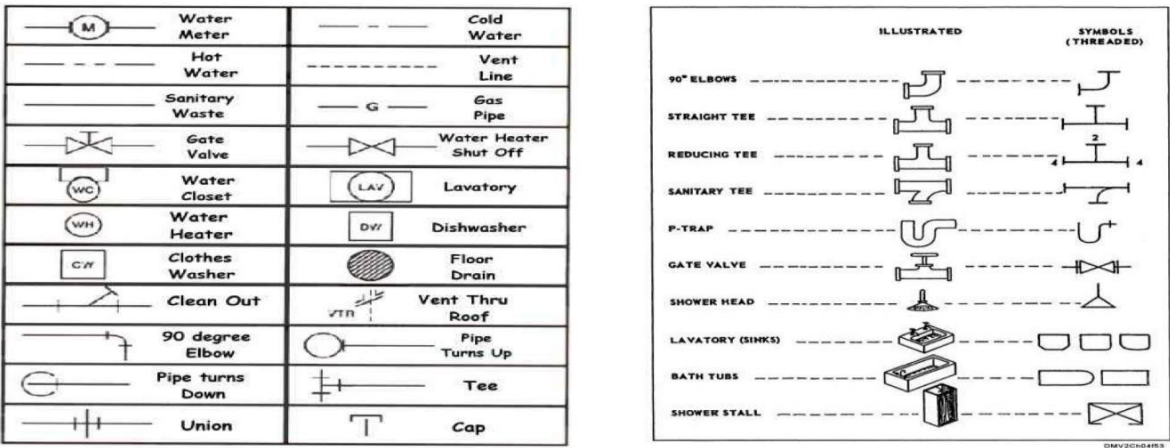
Regulations concerning it may vary; some places don't allow its use at all.

Improvements in the materials and an increasing amount of experience with plastic piping seem to indicate that more uniform regulations can be expected.

Since changes will always occur- in materials, in methods of joining pipes – an absolutely current plumbing code will never be possible.

- Every home plumber should have a copy of the local code. (Get this from the building inspector's office; cost is usually low.)
- When you do any plumbing, check the code first. If the material you're planning to use isn't mentioned in the code, check with the building inspector.
- Some plumbing codes prevent anyone but a licensed plumber from doing certain kinds of work.
- Most codes, allow homeowners to do all plumbing work in homes they own and live in.
- Check your code before you begin any work.

Common Plumbing Symbols



Drafting

Concept of Drafting

- In most cases before making the final plan it takes the form of sketches and drawing
- Sketches usually precede the making of scale drawing of an object.

- An attempt to make something without having a definite plan usually results in waste of materials and time as well as in a poorly constructed project.

DRAFTING EQUIPMENT

In order to do planning or drafting work it is first necessary to learn the names of the tools the draftsman uses and the way he uses them to produce a good drawing. In addition it is necessary to learn certain rules and regulations which are the principles of good drafting.

– Drawing Pencils

- Drawing pencils is made of a much better grade of graphite, commonly called lead, than the ordinary writing pencils so it is possible to draw lines which are of uniform blackness and to do better quality of line work.
- The hardest of the drawing pencils is the 9H. The next hardest in order are the 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, HB, B, 2B, 3B, 4B, 5B, and 6B. The 6B is the softest of all the drawing pencils. It is used mainly by artists for sketching. Most work in engineering drawing is done with the 4H, 2H, and H pencils. Generally the 4H pencil is used for layout for construction lines, the 2H pencil for general line work, and the H pencil for lettering.
- To do good drawing it is necessary to work with a good sharp pencil point. This is why drawing pencils are used for our drawing rather than the regular writing pencils. The best kind of a pencil point for the beginner is the conical-shaped point. The graphite should be exposed about 3/8 of an inch, and the wood about one inch making a total of 1 3/8 inches. A pad of sand paper is useful in keeping pencil points sharp.

• Cross-Ruled Paper

- Paper which has uniformly spaced lines running both vertically and horizontally is called cross-ruled papers.
- The lines are commonly spaced at 1/8 inch or 1/4 inch apart.
- The paper is used for preliminary drawings of objects, either freehand or mechanically.
- Each unit of space may be used to represent an inch, a foot or a fraction thereof, thus making it much easier to have the drawing in the proper scale or proportion.
- The ruled lines also help the sketcher to make lines straight either horizontally or vertically.

• Rule

- A rule is necessary in order to make sketches of objects. For example, the designer or draftsman may be required to make a freehand sketch of a machine part.
- A rule is necessary to make the measurements from the part. These measurements must then be placed on the sketch as dimensions.

The rule is not used to draw straight lines of a mechanical drawing.

- The rule should be graduated into sixteenths or preferably sixty fourths of an inch. Whenever it becomes necessary to have more accurate dimensions than 1/64 of an inch, a micrometer should be used. For small parts a 6ll steel rule is suitable; for larger ones a 36ll steel rule should be used. .

– Erasers

- When an error happens when making a drawing like a line is drawn too long or in the wrong place, the correction is done by using an eraser.
- There are many kinds of erasers available but the draftsman doing only pencil work needs really just two kinds. First he needs an art gum, which is used mainly for cleaning soiled drawings and tools and for erasing lines which are not very close to other lines. Along with the art gum, the draftsman should have a good rubber eraser with fairly sharp edges. The sharp edges enable the user to erase a line in a congested area of the drawing without erasing the adjoining lines.
- The eraser should have no coarse abrasive in it. An abrasive eraser is not needed on pencil work; also, it will ruin the surface of the drawing paper.
- A sharp knife or razor blade is sometimes used by draftsmen in scraping off incorrectly inked lines.

– Drawing Board

- Smooth surfaced drawing boards are usually made of soft wood such as basswood or pine in which thumbtacks can readily be used.
- They are usually made with a cross strip on each end of the board to prevent warping and splitting.
- Large boards usually have cleats fastened to the back side of the board to serve the same purpose. The edges must be straight, smooth, and square to provide a working edge for the T square.
- Drawing boards come in various sizes such as 12ll x 17ll, 16ll x 21ll, and 20ll x 24 1/2
- Special boards with a parallel rule attachment, which eliminates the need of a T square, may not be purchased.
- Drawing tables with a drawing board top which can be adjusted to various angles and heights may be obtained.

• T Square

- The T square is used to draw all horizontal lines. It is also used for a guide in drawing inclined and vertical lines with the triangles.
- It is composed of two parts, the head and the blade. These parts are rigidly fastened together so that the working edge (or top edge) of the blade forms a right angle with the head.
- The better quality T squares have clear transparent edges which enable the draftsman to see lines through them.
- T squares are usually made in the following lengths: 15, 18, 21, 24, 30, 36, 42, 48, 54, and 60 inches.
- To keep T square in good serviceable condition it should receive gentle treatment to protect the edges of the blade from nicks.

- The joint between the head and the blade must be rigid so as to prevent play, which would result in inaccuracies in the drawings.
- The head of the T square should be used against the left edge of the drawing board, when the pupil is left handed; in that case it should be used against the right edge.
- It should be held firmly against the edge when in use so as to insure that all horizontal lines are parallel and that vertical lines are perpendicular to the horizontal lines.

• Triangles

- There are two triangles the draftsman needs. They are a 45° triangle and a 30°– 60° triangle.
- The 45° triangle has two angles of 45° and one of 90°, while the 30°- 60° triangle has one angle of 30° one angle of 60°, and one angle of 90°.
- The better triangles are made of celluloid or plastic; the cheaper ones are made of wood. The advantages of celluloid triangles are that they do not chip or break as easily as the wooden ones and they are transparent, which enables the draftsman to see through them.
- An 8" 45° triangle and a 10" 30° - 60° triangle are good sizes to use for average work.
- To draw vertical lines with the triangle one edge is held along the upper edge of the T square so that the right angle of the triangle is adjacent to the edge of the T square and is in the lower left hand position. The pencil point is placed along the edge of the triangle down near the blade of the T square and then drawn away from the T square. Always rotate the pencil as the line is being drawn; this produces a line of uniform width.
- Lines making angles of 45, 30, 60, 15, and 75 degrees with the horizontal or the vertical may also be drawn with triangles. Triangles may be used as a straight edge in drawing a line through two given points. The T square may also be used for this purpose.

LETTERING

- Lettering is usually done freehand. In general, there are two styles of lettering-engineering and architectural. Either one of these two styles may be made vertically or inclined.
- Complete instructions for making a machine part or for building a house cannot be recorded without a few notes to supplement the drawings. Also it is imperative that the dimensions be placed on the drawing so that the object may be made the correct size. In order that these notes and dimensions may be clearly and easily read they are lettered.
 - The ability to letter legibly and neatly is useful in other ways than in drafting. For example, lettered names and addresses are frequently required. *Print! Don't write!* Is a common suggestion.
 - In order that the lettering will all be the same height, two light horizontal lines are drawn – one for the top of the letters and other for the bottom. These light lines are called **guide lines** because they serve as guides in making the letters all the same height.
 - When vertical lettering is used vertical guidelines should also be drawn to guide your hand in making the vertical strokes in the letters. Vertical guidelines are drawn lightly and are spaced at random, usually about $\frac{3}{4}$ of an inch apart.
 - Horizontal guide lines should be carefully spaced. A special lettering device for lettering may be used, or spaces may be accurately measured with the scale. In every case they must be spaced uniformly and drawn very lightly with a very sharp pencil. It is not necessary to erase these lines if they are properly drawn.
 - A good height of lettering for dimension and notes on a working drawing is $\frac{1}{8}$ of an inch. For the lettering of subtitles $\frac{3}{16}$ of an inch is recommended. Many other heights of lettering are often desirable.
 - Most drafting rooms today use upper case (meaning letters are taken from the old-time printer's upper case where the capitals were kept) or capital letters for nearly all lettering. A few offices use both upper case and lower case (small) letters.
 - When lower case letters are used, capitals are used in the beginning letter at the start of a sentence, for proper names, and for the beginning letter in the series of words which do not make a complete sentence.
 - All titles should be lettered with capital letters. When only capital letters are used, the beginning letter of each sentence is often made higher than the remaining letters.
 - When using lower case letters, at least three horizontal guide lines and sometimes four are used. One is drawn for the top of the tall letters such as b, d, f, and h. Another line is drawn for the top of the body of the letters and other and another for the bottom of the body of the letters. Sometimes a final line is drawn for letters which extend below the others such as g, j, p, q, and y.
 - When using two heights of capital letters only three guide lines are used- one for the top of the taller letters, a second one for the top of the shorter letters, and one for the bottom of all letters. All guide lines should be drawn with a very sharp hard pencil.
 - Composition is the spacing of the letters to form words, the spacing of words to form sentences, and the spacing of sentences to form paragraphs.
 - In order to get good spacing of letters in forming words, the areas between the letters should be approximately equal. This does not mean the horizontal distances are equal. The space between two words in the same sentence should be equal to the height of the line of letters; that is, the body of the lower case letters or the height of the capitals, when only capitals are being used.
 - Certain combinations of letters such as the L and T may be overlapped slightly when they appear in this order. The space between sentences should be about twice as great as the space between words. This makes the lettering easier to read.
 - Sometimes it becomes necessary to fit lines of lettering into a limited space. In order that all of the letters will fit, it is necessary to condense the letters. These condensed letters are the regular ones except that the horizontal distances have all been decreased in the same ratio. Also the space between letters is decreased uniformly.
 - When a few words are to be put in a wide space, letters may be extended. Condensed and extended lettering are very useful in lettering titles on drawings or maps.

LINE TECHNIQUES

- Drawing can provide a very definite description of an object. The lines are drawn according to certain standards already recognized by draftsmen and the people who read drawings.
- Certain types of lines are used for object lines, others are used for center lines, and still others for dimension lines. In making a pencil drawing there are different line widths or weights. Commonly used are the wide or medium line and the narrow or light line.
- In ink work three line widths, heavy, medium, and light, are used.

Kinds of lines

- *Outline of parts.* It is used to represent the visible edges of an object when making a drawing. When done in pencil it uses medium line; when done in ink, it uses heavy line.
- *Section line.* It is used to indicate the sectional views.
- *Hidden line is a dashed line.* It is a medium weight line used to represent edges of an object which are hidden from the view. The dashes are about 1/8" long and the spaces are about 1/16" long. It is very important that they be kept uniform in length.
- *Center line.* Is a light line made up of a series of long and short dashes. The long dashes are from 3/4" to 1 1/2" long and short dashes are about 1/8" long. The spaces between the dashes are 1/16". Here again the spaces and dashes must be uniform in length. Center lines are used to indicate the centers of holes or the center of symmetrical objects.
- *Dimension lines.* Light solid lines except where they are broken for placing the dimensions. These lines are used to indicate that the dimension is measured in the direction of the line and the points of the arrows at each end show the dimensioned distance. This same width of line is used for extension lines.
- *Cutting plane lines.* Heavy lines made up of a series of one long dash about 3/4" long and then two short dashes each about 1/8" long. Cutting plane lines are used to indicate the position of the cutting plane when making a section.
- *Short break lines.* Heavy wavy lines. They are made freehand and indicate that the portion of the object has not been shown on the drawing. This line is used where the break is short.
- *Long break lines.* Light lines with a short freehand portion inserted about every 3/4 of an inch. These lines are used to show that a part of the object is not shown on the drawing. This line is used where the break is long.
- *Alternate position or adjacent parts lines.* Lines which are made up of a medium weight line composed of a series of dashes about 1/32" long. Sometimes parts of machines which move from one position to another have to be shown on a drawing in one position, and then shown in the alternate position.
- *Ditto lines.* Used to indicate identical parts after a few have been drawn in detail. These lines are medium weight and are composed of short dashes grouped in pairs.
- *Construction lines.* Are not shown in the alphabet of lines because they are lines which never appear on the finished. They are for the use of draftsman only. The same is true of guide lines for lettering, since they are for the purpose of aiding the draftsman in making a neater job of lettering.
- *Parallel lines.* Are lines that never meet no matter how far they are extended.

Methods of Drawing Lines

- In general, drawings are made up of straight lines and curved lines. The straight lines fall into three groups, horizontal lines, vertical lines, and inclines lines.
- Curved lines may be an arc, a complete circle, or one of the other curves of the conic section or just an irregular curve.
- A horizontal line is drawn along the top edge of the T square. It is drawn from left to right. Vertical lines are drawn along the vertical edge of the triangle. Vertical lines are drawn away from the draftsman. Inclined lines are drawn in the most convenient direction. Angles of 15°, 30°, 45°, 60°, or 75° with the horizontal or vertical may also be drawn with the triangles and T square.
- To draw any straight line, place the pencil along the edge of the T square or triangle so that the pencil lies in a plane which is at right angles to the surface of the paper and inclines in the direction in which the line is being drawn. The pencil should be inclined about 60°. While drawing the line the pencil should be rotated slightly so that the point wears uniformly and produces a line of uniform width.

PICTORIAL DRAWINGS

- To express an idea clearly a drawing is made which is understandable by those who will see it. There are several kinds of drawings which may be grouped into two general classes – pictorial drawings, and working drawings. Under the general heading of pictorial drawings are isometric, oblique, and perspective drawings.
- The word —pictorial comes from the word picture; therefore, a pictorial drawing resembles a picture. As a matter of fact, a photograph taken with a regular camera represents a true perspective, which is one type of pictorial drawing.
- In engineering work an isometric type of drawing is quickly made and easily read, but the appearance of the object is somewhat distorted. It shows three sides of the object. Oblique drawings are also frequently used in engineering. They also show three sides of the object and may be used to show the front in true shape.
- In isometric drawings, all the principal edges of the object except the vertical edge are drawn at 30 degrees to the horizontal. The bottom and top edges, which would normally be horizontal, are drawn 30 degrees with the horizontal.
- All edges are measured their true distance in isometric drawing. Isometric drawings are used to show the front, top, and side of an object in their actual relation to each other.

- Some objects have inclined surfaces or edges. To show an inclined edge of an object in isometric drawing it is necessary to locate carefully each end of the line by making measurements from the respective vertical and horizontal edges and then draw the line between these two points. This type of line is called a non-isometric line.
- A disadvantage in isometric drawing is that any surface of the object having a circular hole, or circular shape presents a problem in drawing. However, circles or arcs may be drawn in isometric.

Oblique Drawings

- Another commonly used type of pictorial drawing is the oblique. The oblique differs from the isometric in that only two faces are drawn at an angle. The receding faces-top and right and left sides-may be drawn at any angle. Most commonly used, however, is 45 degrees.
- Another type of pictorial drawing is perspective. This used more by artists and architects than by engineers. It, however, more nearly resembles the way objects actually appear to the observer than does either isometric or oblique.
- One-point and two-point perspective are the more commonly used kinds. In one-point perspective all horizontal lines point toward the one vanishing point, which is located on the horizon.
- In two-point perspective the horizontal lines running in one direction lead to one vanishing point and the horizontal lines running in the other direction lead to a second vanishing point. Both vanishing points are located on the horizon line.
- The vanishing points are chosen so that the faces of the objects are made long or short depending upon whether you wish to show more of one face or the other.

ORTHOGRAPHIC PROJECTION

- The working drawing provides the mechanic with the information about the size and shape which is necessary for the construction of the object.
- Working drawing may contain two, three, or more views. Three views are adequate for giving the construction information for a majority of projects and two views are adequate for some.
- The draftsman must learn to arrange his work neatly and in a well balanced manner. It is necessary for the draftsman to show the tie rack so that all points are in their true relationship and all dimensions are shown as they actually are. This enables any person who can read working drawings to understand the size and shape of the tie rack.
- It is necessary to draw the tie rack in three views in order to show how it looks from side, top, and end. When objects are drawn in several views, all dimensions can be shown clearly.
- Since each view can show only two dimensions, the third dimension has to be obtained from one of the other views. With the three views it is easy to show entire dimension and to indicate the depth and placement of the thirteen holes for the dowels. Also, it is easy to show details of the chamber.
- The auxiliary views are drawn to describe the block ore completely. It is usually not necessary to draw more than one or two auxiliary views.
- Two views are adequate to completely describe a plane cylinder or a cone and one view is adequate to describe sphere.

Dimensioning Drawings

- All working drawings must be clearly dimensioned so that the workman can construct the various parts to the correct size. Dimension figures should be about 1/8" high, and fractions should be 1/4" —high.
- The dimension lines are fine, full lines which contrast with the outline of the object and contact extension lines with long, slim arrowheads. Extension lines do not contact the outline of the object but begin 1/16" from the object outline and extend about 1/8" beyond the dimension lines.
- Dimensions should be placed between views and not on the face of the view. The smaller dimensions are placed nearest the view. The symbol is used for inches and for feet. Feet and inches are indicated as 9'-3". Feet and no inches are indicated as 9'-0".
- The dimensions of the circles are shown by the diameter and arcs by the radius.

GEOMETRIC CONSTRUCTION

- Knowledge of simple geometric construction is essential to the draftsman or engineer and is useful to the layman in reading drawings, making plans, and developing sketches of the objects to be made.
- An obtuse angle is one which is greater than 90° and less than 180°.
- Acute angle is one which is less than 90°.
- Equilateral triangle has all three sides and angles equal.
- Obtuse triangle has one angle greater than 90°.
- Scalene triangle has no two sides equal.

Drawing Tangents

- Tangent lines are frequently used by the draftsman. A straight line is tangent to a circle when it touches it at only one to a point, and the radius of the circle drawn to the point of tangency is perpendicular to the tangent.
- Hexagons are six-sided figures which are frequently used in machine drawing for showing hexagonal heads of bolts and screws.
- Regular hexagons have six equal sides and six equal angles.

- A vertical line and two 30 degrees line are drawn through the center of the circle. This divides the circumference of the circle into six equal parts, When the points, the circumference of the circle are connected the hexagon is formed.

Ellipses

- Ellipses are necessary in drafting when oval shapes are required. The pin and string method is often used in laying out an ellipse.
- Graphs and charts are widely used to show in an objective manner the relationship of different numbers, sizes of object, speeds, and surface areas.
- The ability to read charts intelligently and to make simple graphs and charts to illustrate your ideas is an important part of general education. Graphs and charts provide an effective method of portraying ideas quickly and interestingly.
- Lines graphs, bar graphs, area graphs, volume graphs, pictorial graphs, and organizational charts are common devices for portraying ideas graphically.
- Line graph is usually constructed by placing two sets of figures in relation to each other on axes formed by two lines perpendicular to each other which intersect at a point.
- Horizontal line is the abscissa or the X axis. The zero point is called the origin.

Bar Graphs

- Bar graphs are excellent for comparing quantities, values, and percentages. The height of each bar represents different percentage or quantity.
- Bar graphs are most effective when only a small number of bars are used. The bars should all be spaced equidistant.

Area Graphs

- Pie chart is useful in making percentage comparisons. It is easily used, easy to make, and easy to read.
- The circumference of the circle is 360°, and it is common practice to think of the circumference of the circle as being divided into 100 equal parts.
- Each part is equal to 3.6° on the circumference. The sum of all divisions of a circle or pie chart should be equal to the circumference.
- The percentage divisions of the circumference are connected with the center of the circle, and the segments are cross hatched and labeled.

Volume Graphs

- Volume graph is suitable when only two or three items are to be compared. The third dimension shown makes this type of graph particularly useful in comparing volumes.
- Pictorial comparisons can be made effectively by using geometric or pictorial symbols
- Like the volume graph, pictorial graphs often give the impression of the third dimension and are useful in comparing volumes.
- Organizational graphs are useful in showing the relationships and functions of different departments of an industry, a school system, or a government organization.
- The organizational graph enables the reader to grasp the whole organizational framework at a glance.

Maps

- The ability to read maps enable one to find directions easily and, improve means of transportation.
- The common types of maps are geographic, topographic, relief and contour.
- The geographic map shows the boundaries of countries, important town, cities, mountain ranges, main roads, rivers and lakes.
- The topographic map is used to show in some detail the top view of a section of a country
- A relief map shows the relative elevations of the ground surfaces.
- Contour map are made when contour arte given with elevation.

TECHNOLOGY AND LIVELIHOOD EDUCATION

Focus: Entrepreneurship

PART I – CONTENT UPDATE

Definitions of Entrepreneur

- An entrepreneur is one who bears uncertainty, buys labor and materials, sells product at uncertain prices (Cantillon)
- Entrepreneur is an adventurer, undertaker, and projector. His function is to supply and accumulate capital.
- An entrepreneur is an innovator. He does new things or does things in anew way. He supplies new product; makes new techniques of production; discovers new markets and develops new source of raw materials. (Schumpeter)
- An entrepreneur always searches for change, respond to it and exploits it as an opportunity. (Peter Drucker)
- An economist, explains that an entrepreneur is one who shifts economic resources from an area of lower productivity to an area of higher productivity and greater yield.

- In the dictionary entrepreneur is defined as a person who organizes, operates, and assumes the risk for business ventures.
- The pure entrepreneurs are those who launch their own venture from scratch. They search for new materials even from scarce resources and develop it providing new idea-producing opportunity.
- According to the author of the book *The Practice of Entrepreneurship* Geoffrey Meredith, entrepreneurs are people who have the ability to see and evaluate business opportunities, to gather the necessary resources and to take advantage of them, and to initiate appropriate action to ensure success.

Characteristics of Entrepreneurs

- Characteristics are distinguishing traits or qualities of an individual. These are favorable interdependent characteristics which make one successful and extraordinary person. Here some of the most important characteristics of entrepreneurs :
- *Self confident* . Entrepreneurs have a strong belief in their abilities, talents and skills. They do not accept things as it ordinarily exist. They see to it that they can do better.
- *Hardworking*. Successful people work far beyond the regular time-schedule. They enjoy challenges and difficult tasks, and love their work. When people love work they don't consider it sacrifice but instead joy. In fact people who are always busy forget their worries and problems.
- *Reasonable risk-taker*. This characteristic makes one enjoys challenges but are careful and experience less damage. Life is very uncertain. A successful entrepreneur faces the fact that in business there are success and failure. So, to avoid high risk situation the entrepreneur must gather complete data about the situation, analyze data before making the decisions. Considering the risk –taking abilities of entrepreneurs, they make things happen instead of making them just happen.
- *Positive thinker*. They always think of the bright sides of life that success begets success. If one thinks of doing the right things it will not turn out wrong. Individuals who always think of failures and other negative thoughts will exactly get what they think. Their failure consciousness or defeatist attitude will make them experience failure one after the other.
- *Innovative*. Entrepreneurs are creative. They make new things in a different ways. They are interested in exploring the unknown, and blaze new paths for progress. Innovations are made in response to the needs of people. For instance, high costs of production serve as an opportunity for entrepreneurs to introduce a technology that can reduce costs of production. Without innovations people will remain in their primitive stage of development.
- *Decision- maker*. Being creative and innovative, an entrepreneur makes decisions on how to improve the products, how to explore new markets, how to continuously satisfy consumers, and how to maximize profits.
- *Leadership*. With the nature that entrepreneurs are task-oriented, they are effective planners, organizers, implementers and achievers. Hence they possess the qualities of good leaders as: selfless dedication, purpose and vision, courage, conviction, integrity, tact, enthusiasm, perseverance and honesty.

Concepts of Filipino Entrepreneur

- *Self-reliant*. An entrepreneur relies mainly on his own efforts in doing works. He do away from depending on others and refuses to be dictated.
- *Risk-taker*. He dares to be challenged and transformed problems into opportunities. Despite of setbacks, mistakes and failures, he continues and starts all over again.
- *Creative*. He is not satisfied with what is existing . He keeps on trying new and better ways of doing things. He takes the initiative of exploring the unknown.
- *Industrious*. He has a sense of perseverance and strong pride in the workmanship of his product. He is quality conscious in all the components of his business.
- *Humble*. He is at work patiently, unmindful of his social status. He is hands on with the related works of his business and not ashamed of doing it.. He believes in simple needs and humble beginnings.
- *Helpful*. He works with others from different fields believing that through cooperative works, he shows that he truly cares for the welfare and the development of the entire business.
- *Happy*. Satisfaction of customers gives joy to the entrepreneur. So he attends to the real needs of his customers with dispatch, efficiency and graciousness. A happy man finds rewards in the joy of giving.

Determinants of Successful Entrepreneurship

Possessing the different good traits is not enough if there is no efficient management. The entrepreneur must possess the following managerial skills:

- *Ability to conceptualize and plan*. An entrepreneur must plan considering all the aspects of the business such as product, price ,cost inventory and other related matters in a coordinated manner for the total operation of the business. He must have a foresight of upcoming problems and must at least have in mind the necessary realistic solutions.
- *Ability to manage others*. One function of entrepreneurship is to generate employment. This requires management of people. The entrepreneur must be able to organize work assignments properly so as to elicit maximum efficiency and productivity. Good human relations and communication should be skills that an entrepreneur should possess to achieve the objectives of the enterprise.
- *Ability to manage time and to learn*. In view of the various functions of the entrepreneur, he should be an expert on time management. He should also acquire basic training in small business management and specialized courses in accounting, finance, marketing and personal relations. Learning is a lifelong process. Learning can also be acquired through reading, attending seminars, traveling and being keen observer.

- *Ability to adapt to change.* Sticking to traditional and established practices resulted to stagnation. An entrepreneur keep on searching for the changing needs and tastes of consumers. Being creative and innovative make it easier for an entrepreneur to quickly respond to change.

Nature of Production

- Production is the creation of goods and services and utility. Goods and services are produced to satisfy human needs and wants.
- Entrepreneur is the vital factor in transforming resources into goods and services. Hew decides the proper combination of resources, such as the application of more labor and less machine. He also decides what to produce, how to produce, when to produce and where to produce.
 - Producing a product or service which is new in the market comes from an idea., then it is planned and developed into a new product or service.

Production Resources

- **Material resources.** These are tangible, physical resources which are used for production. In an industry examples are steels, cement, glass , etc., in agriculture fertilizers, seeds machines used in farming, etc., in schools there books, chairs, rooms laboratories and other physical facilities.
- **Human resources.** These are the most important resources. It is the people who plan and implement business activities. Being so important progressive corporations emphasize human resource development through education and training of the employees.
- **Financial resources.** These involve funds for various purposes. Without sufficient funds there will be impediment of production.
- **Informational resources.** Correct and complete information is vital to the success of any forms of business. Facts are very important in making plans, decisions and implementation of plans. The entrepreneur must know the needs of the customers, the strategies of the business rivals, the recent technological developments, business policies of the government

Factors of Production

- **Land.** Includes natural resources, such as forests, mountains, and bodies of water like rivers, lakes, and seas.
- **Labor.** This refers to both physical and mental efforts like the works of farmers, fishermen, outputs of workers, clerks lawyers, teachers, doctors, etc.
- **Capital.** Pertains to machines, equipment, buildings and other physical resources which are used in the production of goods and services. This is also used for starting a business.
- **Entrepreneurial ability.** The ability to coordinates the other factors of production such as land, labor and capital. Without this factor other resources would be useless.

Costs of Production

- Costs of production represents the payments for the factors of production. These affects the ability and willingness of entrepreneur to produce.
- When production costs are high, prices go up. This decreases the purchasing power of the customers. This results to lower quantity demanded for goods and services.
- Producers must choose productive resources which are abundant in supply, because these are much cheaper than when there is scarcity in supplies. Cheaper inputs mean lower costs of production.
- The total costs of production is the sum total of expenses in producing a product or service. It is equivalent to the sum of fixed cost and variable cost. The rents are fixed cost while the expenses on raw materials are variable costs.
- If there are production, there is no variable cost, but there is fixed cost.

Rules of Production

- **For long-run period**
 - When total revenue (TR) is greater than total cost (TC), produce more
 - When total revenue is less than total cost, stop producing.
 - When total revenue is equal to total cost, maintain production.
 - TR being more than TC means profit. The opposite is loss. When TR=TC ,it is breakeven. There may be no profit, but also no loss, yet there is payment for the entrepreneur. Thus it is still good to maintain production.
- **For short –run period**
 - When TC is greater than VC, operate
 - When TR is less than VC, shut down.
 - Variable cost (VC) refers to the operating expenses like salaries, cost of raw materials, office supplies, and bills like water, telephone and electric.
- Technology refers to the process of transforming resources into goods and services. Technology requires modern machineries and less number of workers.
- Philippines adopt intermediate technology which means it is between primitive technology and modern technology. This requires local labor and material, and simple management.
- Our country has an abundant supply of idle labor and raw materials. Entrepreneur can utilize such cheap resources for the production of goods and services. Such endeavor can reduce the problems of unemployment, and can contribute to the economic development of our country especially in the rural areas.

Inventory Control

- Inventories are stocks of goods and materials. There are three types of inventories :
 1. *The raw material inventory*. These are stockpiles of materials for inputs of production
 2. *Work-in process inventory*. These are partially completed products that require further processing.
 3. *Finished-goods inventory*. These are completed goods for delivery to customers.
- Each of these inventory has a storage cost and a stockout cost. The stockout cost refers to the running out of an inventory which could mean no products to sell
- Scheduling is the process of ensuring the delivery of materials at the right place and at the right time. Such materials can be raw materials, semi-finished goods or finished goods. Movement of these materials or products require specific time to avoid delays.
- The *raw materials* may be moved from the storage facility to the work station. The *semi-finished products* may be moved from one work station to another work station. The *finished products* maybe transported from the warehouse to the stores or direct to the customers.
- The PERT (Program Evaluation and Review Technique) is used to monitor and control scheduling of activities. Under PERT, all the major activities are represented by arrows. The path that requires the longest time from the first event to the last event is called *critical path*. The activities along this apth should be scheduled and controlled. A delay in just one activity causes a delay in the completion of the whole

project. **Quality Control**

- Quality control is the process of ensuring that goods and services are produced in accordance to the specifications and requirement.
- Quality has become the central point of business to establish reputations.
- There are two ways to ensure the quality of products. One is the formation of quality circle. A group of employees officially meets to study and solve problems of quality. Another is through inspection. This is being done at various time during production
- The principal objective of quality control is to sustain the standard or reputation of the enterprise. Such objective must be in line with the goals and objective of the establishment to maximize customer satisfaction.
- High quality attracts more customers which results to more profits. Without quality control, more rejects or factory defects will be result.. this is additional cost of production.
- Productivity means the efficient creation of goods and services. This is measured by the number of products produced.
- Productivity is the result of various factors. It can be the workplace, such as lighting, ventilation, and sanitation. If these are not favorable, they may reduce productivity. This can also be influenced by economic factors like salary, overtime pay, and other monetary incentives. Human relations can also affects productivity. If management treats his employees with dignity, respect and justice, productivity is improved. And they are capable of attaining peak performance.
- Marketing is defined as asset of human activities directed at facilitating and consummating exchange (Professor Kotler). These definition includes three elements :
 - two or more persons who are potentially interested in exchange
 - each person having things of value to offer to the others
 - each of them is capable of communication and delivery
- Marketing is a transaction intended to satisfy human needs. (Professor William Stanton). Aside from goods and services, ideas, people and places are being marketed.
- Marketing includes an integration of various functions, such as marketing research, new product development, advertising, customer service, distribution and selling. Selling is only a part of marketing.
- The marketing concept determines the needs of the customers first, then develops the product and service to satisfy such needs. Marketing is customer-oriented while selling concept is focus on the needs of the seller.

Importance of Consumer Service

- Since customers are the heart of an enterprise, the customers should be put first in the business. The following are some approaches in customer service :
 - ☐ *Train all employees to be courteous and efficient*. They immediately attend to the needs of the customers. Waiting for long to get the product reduces customer satisfaction.
 - ☐ *Coddle the customer*. Customers should treated with dignity like replacing damage items without questions.
 - ☐ *Remember that dissatisfied customers tell others about their experiences*. Dissatisfied customers can convince other not to patronize your product or the store itself.
 - ☐ *Listen to feedbacks about your business*. Feedback can improve services and quality of products.

Marketing Plan

- A marketing plan is an outline of actions designed to achieve a specific set of goals. This should be compatible with the marketing resources and the external environment of the enterprise. The external environment consists of :
 - Economic forces* - such inflation and unemployment which directly influence the purchasing power of the consumers. For example, when prices are high, people can only buy a lesser number of goods and services.
 - Societal forces*- like social and cultural values and traditions that greatly affect the choice of goods and services by consumers. For instance, many Western habits are not allowed in the Middle east due to differences in religious beliefs and practices.
 - Technological forces* – such as new methods and new machineries that can be both positive and negative to marketing. Positive in the sense that entrepreneurs can avail of the benefits of better technology to improve

the quality of product and reduce the cost of production. On the other hand, technology can make existing products obsolete.

4. *Political forces* – in the form of governmental laws and policies that regulate marketing activities. Unreasonable taxes dampen the growth of marketing. Unstable government discourages both local and foreign investments

Marketing Strategies.

- Marketing strategy is a consistent, appropriate and feasible set of principles through which a particular enterprise hopes to attain its long-run customer and profit objectives in a particular competitive market.
- Marketing strategies are the tools of achieving the goals of the enterprise. This is consist of : product strategy, price strategy, promotion strategy and distribution strategy.
- *Product Strategy* starts from introduction to growth and maturity And finally to decline.
- *Promotion strategy consist of advertising and personal selling.* Advertising utilizes the media : newspaper, magazine, radio, television, billboard, mail and yellow pages. Personal selling is done on a person-to person basis with a customer.
- *Pricing strategy* help in the conversion of product and services into money.. in business, the apparent objective of pricing is to maximize profit. This is possible in monopoly or oligopoly
- There are several pricing strategies:
 - Some businessman post 4.98 php instead of 5.00php. Others place —Buy one, take onell. There are also those who combined several low-price items and mark the package 9.95php, instead of 2,50php per item.
 - *Prestige pricing strategy.* A very high price is set to project an aura of quality and status.

Penetration pricing strategy. A very low price for a new product is offered. The objective is to develop a large market for the new product as soon as possible.

- *Distribution Strategy* is directs if producers deliver goods to the customers and indirect if a middleman sells the goods to the final users
- It is cheaper for a producer to deliver products directly to a large number of buyers who are concentrated in a very few adjacent areas than in many scattered regions

4. **Retailing** is selling in small quantities.

5. Classification of Retailing

- ☐ General Store. This kind of store has become a permanent institution in the economic life of the country. It carried a wide variety of items
- ☐ Single line store specialize in one single item.
- ☐ Convenient store includes coffee shop, bakery shops candy stores magazine and newspaper stands located in business districts.
- ☐ Specialty shop specializes in certain items which the busy department store cannot offer.
- ☐ Itinerant store or rolling store
- ☐ Large scale retailing like variety store, mail order house, supermarket department store.

Feasibility Study

- A feasibility study help obtained data about the market potentials, location, nature of customers, product and services needed.
- Putting up a business is not a game of chance. It is not a win or lose activity although there are risk to undertake and cannot be avoided like natural calamities.
- **Importance of feasibility study:**
 - ☐ Eliminate business risks because it carefully studies the competence, interest and resources of the entrepreneur against the needs of the consumer, together with the presence of the competitors. Through this study the entrepreneur can determine whether it is profitable to set up a certain kind of business or not.
 - ☐ The resources of production such as money, materials, machines and manpower are properly used and scheduled according to plan.
 - ☐ A good feasibility study can help detect the weaknesses of the business operations.

• Outline of Feasibility Study

Evaluate your personal resources and interest, and the resources of the community

Do you have the necessary funds ?

Are raw materials available ?

Analyze the market

Is there a good demand for the product or service ?

How many competitors are there in the market ?

Who are the customers ?

Are they interested in the existing product or service.

Is it possible to offer a better quality or a lower price ?

Business location

Is it near your prospective customers ?

Are there facilities like electricity, water, transportation and communication?

Is the place clean, decent and peaceful ?

Do you have good alternatives in case the best location is expensive

Is it accessible to raw materials and other supplies ?

☐ Financial Plan

What are the objectives ?

How much capital is needed ?

What are the sources of capital ?

How soon can you recover the investment ?

☐ Production plan

Is it economical to rent or buy production equipment ?

Can your production facilities meet demand ?

Do you have inventory control ?

Do you have proper scheduling of production ?

- Organizational Plan
 - What type of business organization is most suitable ?
 - Who will be the officers and employees of your enterprise ?
- Management plan
 - What are your goals and objectives/
 - What are your strategies ?
 - Do you have business policies for your customers ?

Classifications of Business Organization

The most common forms of private business organization are : sole proprietorship, partnership and corporation.

- A **Sole proprietorship.** This type of business organization is termed as individual enterprise.
- B **Nature and functions of sole proprietorship**
 - a. Only one person owns the business and is responsible for the conduct and operation of the business in which he is engaged.
 - b. He performs the functions of the four productive agents, he provides the site, the capital and do the function of laborer and entrepreneur at the same time.
 - c. The owner enjoys the economic freedom. He is not responsible to any individual for whatever course of action he may decide to take affecting is business.
 - d. This type of business is easy to organize. Obtaining license may come later.
 - e. The owner is entitled to all the profits which the business may able to reap.
 - f. One disadvantage of sole proprietorship is its relative instability. As such when the owner is sick no one will take over.
- α. **Partnership.** Two or more person bind themselves to contribute money, property, or industry to a common fund with the intention of dividing the profit among themselves.
- β. **Partnership may be classified as limited and general partnership.** A general partnership subjects each partner to the liabilities or indebtedness of the business enterprise. All partners share the profits and losses equally or according to some fixed ratio. A limited partnership is one in which partner is liable for the indebtedness of the firm up to a fixed amount.
- χ. **Corporation** is an artificial being, invisible, intangible and existing only in contemplation of law. Its owners are the stockholders or shareholders who can sell their interest in the corporation without affecting the continuity of its operations because the life of the corporation is independent or distinct from that of the owner or stockholders.
- β. **Fixed capital** refers to the money needed to purchase fixed assets or capital goods. This includes amounts meant for the acquisition of machinery, building, office equipment and all those fixed assets required in the production processes or the items needed in the provisions of services to the customers.
- χ. **Working Capital** is needed to fund the day-to-day operations of tehbusiness. This capital represents the money or hard cash to support it normal short-term operations. it is generally used for inventory, payroll, utilities, and also take care of the unexpected emergencies as to keep the business on-going.
- δ. **Growth capital.** This is needed when an existing business is set to expand, diversify or change its direction

Sources of Capital

- ε. Internal fund is owned by the entrepreneur himself.
- φ. Mortgage takes the form of fund generated by way of pledging a designated property as security or collateral for the loan
- γ. Bonds are form of indebtedness which promises a fixed amount of interest to the bond holders upon maturity .
- η. Loans from banks
- ι. Merchandise suppliers
- φ. Credit card companies
- κ. Capital equipment suppliers
- λ. Leasing companies
- μ. Receivable factors
- ν. Lending investors

TECHNOLOGY AND LIVELIHOOD EDUCATION

Focus: Foods

A. Distinguish the common terms in food selection, preparation and cooking

FOOD PREPARATION TERMS

- **Baste** – to moisten meat or other foods while cooking to add flavor and to prevent drying of surface. Liquid is usually melted fat, meat drippings, fruit juice or sauce.
- **Blend** – to mix thoroughly two or more ingredients.
- **Bread** – to coat with bread crumbs alone and to coat with bread crumbs then with diluted slightly beaten egg or milk and again with crumbs.
- **Dice** – to cut into cubes, usually less than ½ inch
- **Dot** – to scatter small bits such as butter over the surface of foods.
- **Dredge** – to sprinkle or coat with flour or other fine substances.
- **Flake** – to break or pull apart a food like chicken or fish that divides naturally.
- **Fold** – top combine by using two motions, cutting vertically through the mixture and turning by sliding across the bottom of the mixing bowl by each term.
- **Grate** – to rub the food against the grater to divide into small particles.
- **Knead** – to manipulate with a pressing motion accompanied by folding and stretching.
- **Marinate** – to let food stand in a marinade – usually an acid –oil mixture.
- **Mince** – to cut or chop in a very small pieces
- **Pare** – to cut off the outside covering
- **Peel** – to strip off the outside covering.
- **Score** – to make light cuts on a surface, to cut 1/8 inch to ½ inch intervals in the fatty edge of steaks or chops to prevent edges from curling during cooking.

- **Skim** – to remove a floating layer by passing a utensil or —skimmerll under it, as skimming cream from milk, excess fat from broth or scum from jelly and broth.
- **Whip** – to beat rapidly to produce expansion due to incorporation of air. This is applied to cream, eggs, and gelatin dishes.
- **Toss** – to tumble ingredients lightly with a lifting motion. Use two forks or a spoon or fork.

FOOD COOKING TERMS

Baking – to cook in an oven type appliance. Covered or uncovered containers may be used.

Barbeque – to roast solely in a grid-iron, over coals or under a free flame or even electric unit, usually basting with a highly seasoned sauce.

Blanch – to preheat in boiling water or steam.

Braise – to cook slowly in a covered container in a small amount of liquid or steam.

Caramelize – to heat sugar or foods containing sugars until a brown color or characteristics flavor develop.

Fry – to cook in fat; applied especially (1) to cook in a small amount of fat also called stir or pan-fry, (2) to cook in a deep layer of fat also called deep-fat fry.

Sear – to brown or cook in small amount of fat.

Stew – to simmer in a small quantity of liquid.

Stir-fry – to fry quickly and turn frequently in a small amount of fat; also means to sauté.

B. Explain the food nutrients and their sources

Nutrients are chemical substances found in food performing various roles in the body namely: to provide heat and energy, to build and repair body tissues, and regulate body processes. Since nutrients are found mainly in natural food, adequate intake of these nutrients is necessary to carry out physiological functions of the organism. However, there are also nutrients manufactured in the laboratory. These are called synthetic nutrients. These man-made nutrients are mostly used for therapy and for research. They are also used for enrichment, supplementation, or fortification of some food items in which the nutrients get lost in processing.

Nutrients can be classified in accordance with the following:

- As to function** – nutrients the form tissues in the body are body building. Protein is the major nutrient responsible for this. It comprises about 20 % or 1/5 of the body weight. Nutrients that furnish heat and energy are fat and carbohydrates and occasionally protein. Fat comprises 20 % or 1/5 of the body weight while carbohydrates about 1 % only. Nutrients that regulate body processes are vitamins and minerals. Minerals account for 4% of the body weight while vitamins, which are not really part of the body's structural components comprise a measly amount of about 28 grams. Water which is not considered a nutrient is essential in regulating body processes and is most abundant in the body. It accounts for about 66% or 2/3 of body weight. Carbohydrates, fats and protein are caloric nutrients while vitamins and minerals are non – caloric nutrients.
- As to chemical properties** - the nutrients are classified as either organic or inorganic. Organic nutrients are those which contain carbon. These are protein, fats, carbohydrates, and vitamins. On the other hand, the inorganic nutrients do not contain carbon in their compounds. These are water and minerals.
- As to essentiality** – the essentiality of a nutrient refers to its significant contribution to the body's physiological functioning. A nutrient that performs one function in the body (e.g. iron in the production in red blood cells) is as important as another nutrient that performs more than one function (e.g. Protein for building tissues, repairing tissues, providing energy in the absence of carbohydrates). In other words, all nutrients are equally important because each contributes in varying extent to the normal functioning of the body systems.
- As to concentration** – some nutrients are needed in large amounts than others. Some nutrients exist in very small amounts but they function as significantly as the others. Nutrients present in large amounts are called macronutrients.

These are protein, fats, carbohydrates and water. They are measured in grams. On the other hand, nutrients that exist in very little amounts are called micronutrients. These are vitamins and minerals. They are usually measured in milligrams and micrograms.

The Major Nutrients: Their Specific Functions and Sources

There are more than 50 individual nutrients that have been discovered to date. Of these nutrients the following are the major nutrients that perform major functions in the body.

1. Proteins

These are complex organic compounds composed of carbon, hydrogen, oxygen and nitrogen. Amino acids which are end products in protein digestion are considered the building blocks of this nutrient. They can be classified as follows:

- Essential or indispensable amino acid- they are needed for life and growth and have to be provided in one's daily diet.
- Non essential or dispensable amino acid – they are amino acids which do not have to be present in the diet since they can be synthesized by the body.
- Semi essential - they are dispensable amino acids that become indispensable under special condition e.g. malnourished children and patient recovering from injury or surgery.

Based on the classification of amino acids, proteins can be categorized as *complete, partially complete and totally incomplete protein*. Complete protein contains all the essential amino acids. They are capable of maintaining life and supporting growth. It includes all animal proteins except gelatin. Partially incomplete protein can maintain life but cannot support a normal rate of growth while totally incomplete protein lacks one or more essential amino acids and therefore incapable of replacing or building new tissues.

Proteins are involved whenever the body is growing, repairing or replacing tissue. The following functions of proteins show its importance in body processes.

- For body building – 20 % of the body weight is protein. Minus water, in dry weight, it is approximately 50 % of the total body weight. This consists of muscles, bones, cartilage in the skin and body fluids. —Body buildingll means that protein is an integral part of all body tissues and living cells and it is found in muscles, organs, glands, body cells, enzymes, hormones, antibodies in the body fluids and bodily secretions (except urine, bile, and sweat) and in (the supporting organic matrix for) bones, teeth, skin, hair, and nails. In cases of tissue damage or breakages, protein helps in the repair of body tissues.
- For energy supply – Like carbohydrates, protein provides energy but is rather an expensive source of energy compared to fats and carbohydrates. These secondary role should as much as possible be spared by an adequate intake of fats and carbohydrates.

- b. Regulator of body processes – It helps in the exchange of nutrients between the cells and the fluids within the cells, or between the cells and the blood. It also helps in maintaining fluid balance. Since plasma in blood contains protein, the lack of protein in plasma disturbs the fluid balance. As a result of this disturbance, fluid is accumulated in between tissues resulting in swelling, also called edema. Nutritional edema is a symptom of low protein levels in the blood, called hypoproteinemia.

Protein Malnutrition

Protein deficiency is accompanied by the following symptoms:

- b. loss of weight
- c. general weakness
- d. less resistance to infection
- e. dry and scaly skin
- f. edema
- g. paleness

In addition, growth in children is very slow and in serious cases is retarded. Protein malnutrition is known as kwashiorkor. Children with kwashiorkor are in many cases thin with pot-bellies, swollen feet, dry and abnormal hair, and sometimes with skin lesions.

Sources of Protein

Excellent sources of complete proteins are animal origin. These include the following: Meat, fish, poultry, milk, cheese, eggs, and glandular organs. Plant sources include legumes and nuts. Prominent among this is soybean which is available in the market in various forms such as tokwa, tofu, tahu, tausi, and soya milk. Monggo which is usually prepared in Filipino homes as viand (ginisang monggo) is also good source.

In cases of limited funds and limited animal sources, these can be extended by adding vegetables, legumes, cereals, and root crops. This way, cost per serving is very much reduced. Pancit, menudo, pork and beans, mongo guisado, chop suey, and picadillo are dishes with meat —extendersll.

Below is a partial list of protein-rich and plant sources.

- Animal Sources- lean meat, chicken, eggs, cheese, dried & fresh fish, shellfish, milk & dairy products
- Plant Sources- legumes and seeds such as sitaw, monggo, kadyos, abituellas, garbanzos, linga, sitsaro etc.
- nuts such as peanuts, pili, cashew, etc.
- rice, corn, bread
- carrots, beets, leafy vegetables

2. Carbohydrates

These are large groups of organic compounds found mostly in plants. They contain carbon, hydrogen, and oxygen with a ratio of 2:1 of hydrogen and oxygen, similar to that of water. Carbohydrate foods are mainly starches and sugar which constitute the biggest percentage in one’s diet, approximately 50% to 60% and providing the same percentage in the total calorie needs of the individual.

Classification

- Carbohydrates are classified based in their complexity of sugars. These are polysaccharides, disaccharides, and monosaccharide.
- Polysaccharides – or multiple sugars have more than 10 saccharide units. They consist of the digestible types which are starch and dextrins. Starch is found in cereal grains, rice and rice products, bread and other flour products. Dextrin is found in toasted bread and the intermediate products of starch digestion. The indigestible type consists of cellulose found in skins of fruits, in coverings of nuts and legumes, in stems of mature leaves and hemicellulose which are found in seaweeds and slightly unripe fruits. Glycogen or —animal starchll is carbohydrate stored in the liver and muscles. It is used to supply energy in work and play. Glycogen in liver is changed to glucose and is circulated by the blood to other parts of the body.
- Disaccharides – are sugar hydrolyzed into 2 simple sugar units. It consists of lactose, maltose, and sucrose. Sucrose is cane sugar or beet sugar. It is also found in syrups, molasses, and some fruits. It is used in cooking and in table service; hence it is called —table sugarll. Maltose is s malt sugar produced from the digestion of starch (cereal grains) in the intestines. It is used in making infant milk formulas. Lactose or milk sugar is found in milk and milk products and is the least sweet among common sugars
- Monosaccharides – The simple forms of sugar consisting of glucose, fructose, and galactose. Glucose is also known as dextrose or grape sugar. It is found in fruits, honey, corn syrup, and sweet corn. It is the end product in starch digestion. It is the form of sugar oxidized by the body to release energy. Fructose is the sweetest of all sugars and is found in ripe fruits, vegetables and honey. It is also changed to glucose in the liver and intestine. Galactose is derived from lactose when the latter is hydrolyzed in digestion. It is also changed to glucose to release energy.

Functions of Carbohydrates

The major functions of carbohydrates in the body are the following:

- a. It is the chief source of energy. The glucose at the end phase of digestion is the most readily available source of energy needed by the body during work and play. One gram of pure carbohydrate yields 4 calories.
It is a protein sparer. The presence of carbohydrates in the diet spares the use of protein for energy use. Instead, protein is used for body-building rather for energy-giving. Hence, there is a need for an adequate supply of carbohydrates in the day’s meals.
- ☐ It is a fat sparer. This means that an adequate supply of carbohydrates in the body prevents the incomplete oxidation of fat.
- ☐ It regulates the peristaltic movement of the intestines. With the presence of cellulose or the indigestible fiber which acts as roughage in the intestine, peristaltic movement becomes regular, constipation is prevented, and regular bowel movement is established.

Sources of Carbohydrates

Common food sources include sugars, cereal grains, starchy vegetables, and dried legumes. Specifically, this includes rice and rice products – puto, kutsinta, kalamay, corn, bread, all kinds of root crops, and all kinds of noodles, all bakery products – cookies, sugar, sweets, candies, jams, marmalades, and other related products.

3. Fats

This refers to food fats and oils which are simple lipids. Fat consists of carbon, hydrogen, and oxygen and is usually insoluble in water.

The end products of fats in digestion are fatty acids and glycerol.

Fats are classified according to their physical appearance as a) visible fats which are found in cooking oil, margarine, butter, lard, fats in pork, beef, and chicken; b) invisible fats which are found in egg yolks, milk, avocado, and in lean meat.

Functions of Fat

- It is concentrated form of energy. Unlike carbohydrates, fat supplies 9 calories per gram; which is 2 ¼ times more than carbohydrates or protein. Fat not utilized immediately in the body is stored in the form of adipose tissues found in the intramuscular tissues, around the abdominal area and in the subcutaneous tissues. This is a reservoir of potential energy. At work and at play, this is usually utilized after carbohydrates. When fat storage goes beyond 15 – 20% of the desired body weight, the individual becomes overweight.
- 1. It is also a sparer of protein. Together with carbohydrates fats perform the function of providing energy for the body. For as long as these two nutrients are available in the body, protein is spared from providing energy and concentrates in body-building and repairing instead.
- 2. It carries the fat. Soluble vitamins – Vitamins A, D, E, and K – need a fat-soluble medium to keep them in solution and facilitate absorption in the body.
- 3. It aids in the elimination of waste since fat acts as a lubricant.
- 4. It has high satiety value. When one eats fatty foods, he feels full in a short time and it takes a longer time to feel hungry again.

Sources of Fats

The most important fat sources are the visible fats – butter, margarine, cooking oil, lard, and fats from animals like pork, beef, chicken, and fish. Invisible fats found in milk, cheese, egg yolks, and in nuts and legumes are also good sources. Other specific food products which are good sources of fats are chocolate, sausages, sardines, salad dressings, mayonnaise, coconut, whipping cream, cream cheese, cottage cheese, candies, coffee cream pies, avocado, butter cookies, cheese cakes, whole milk, pastilles, bacon, and nuts.

4. Vitamins

Vitamins are organic compounds which occur in very small quantities in food but are very important to life for specific regulatory functions and the maintenance of life and normal growth. All vitamins contain carbon, hydrogen, and oxygen but some contain nitrogen and some sulfur and cobalt. Vitamins are measured also in milligrams equivalent to one thousandth (1/1,000) of a gram.

Some vitamins in plants and animals are *preformed*, meaning that they are already in active form and ready for their biological function in the body. Some vitamins are present in plants as *precursors*, meaning that they have to be changed to active form to be ready for biological function. An example of this is a carotene or pro-vitamin A. Carotene is called a precursor of Vitamin A.

There are also manmade vitamins which are synthesized in the laboratory. Hence, these are called synthetic vitamins. These synthetic vitamins are mostly used for therapeutic purposes. An individual who eats a well-balanced meal does not need synthetic vitamins because he is assured of the normal intake of vitamins from food sources.

Classification of Vitamins

Vitamins are classified according to their solubility, namely: the fat-soluble and water-soluble. Fat-soluble vitamins include vitamin A, D, E and K while the water-soluble vitamins include vitamins C or ascorbic acid and B complex which include thiamin, riboflavin, niacin, pyridoxine, cobalamin, pantothenic and folic acid, and biotin.

Fat-soluble vitamins or Vitamins A, D, E, and K are soluble in a fat medium while C and B complex are soluble in a water medium. The fat soluble can be stored in the body. Hence, there is no need for a daily intake unlike the water soluble which are not stored but excreted in urine. Fat soluble vitamins are not easily dissolved when cooking; hence, they are stable unlike water soluble vitamins which are easily dissolved in cooking. Because of this unstable nature of the vitamins, the use of synthetic vitamins is sometimes recommended to assure adequate intake of the vitamins and to be assured that no deficiency symptoms occur, because deficiencies easily arise in water-soluble vitamins.

Functions of Vitamins

Fat-soluble vitamins.

1. Vitamin A is important for normal vision especially for normal night vision. This is because Vitamin A maintains the integrity of the mucous linings of the eyes, the skin, the respiratory, and the digestive tracts. Lack of Vitamin A results in the hardening of the linings, e.g., inability of the eye to adjust to light changes. Vitamin A acts as a catalyst in the release of enzymes that act on bone formation. Hence it is important in normal bone and skeletal growth. It is also needed in establishing the cells of both the nervous and reproductive systems.
2. Vitamin D promotes bone and teeth development because it facilitates absorption of calcium and phosphorous.
3. Vitamin E or tocopherol is important for cellular respiration and the prevention of hemolysis (anemia) of the red blood cells.
4. Vitamin K is needed in the proper coagulation of blood by maintaining the prothrombin level in blood plasma.

Water-soluble vitamins.

1. Vitamin C is needed in holding cells together. It maintains the integrity of the cells. It builds body resistance to infection. It improves iron absorption and helps in the healing of wounds and bone fractures. It aids in metabolism.
2. Vitamin B₁ or thiamine helps maintain good appetite, good muscle tone, and normal function of the nerves.
3. Vitamin B₂ or riboflavin is essential for protein, fat, and carbohydrate metabolism. It maintains the health of the skin, tongue, mouth, and normal vision. It is needed for proper growth and development.
4. Niacin is important in energy metabolism. It also aids in photosynthesis in plants.
5. Pyridoxine or Vitamin B₆ is important in amino acid metabolism. It catalyzes urea production, the synthesis of essential fatty acids, and the conversion of niacin from tryptophan.
6. Pantothenic acid is essential for carbohydrate, protein and fat metabolism. It maintains normal growth, healthy skin, and integrity of the central nervous system.
7. Cobalamin or Vitamin B₁₂ helps folate works to make red blood cells. It also helps in maintaining the sheaths that surround and protect the nerve fibers.

Sources of Vitamins

Leafy green and yellow vegetables, fruits, liver, and other glandular organs, legumes, nuts, cereals, eggs, milk, fish and poultry are good source of vitamins.

5. Minerals

Minerals are inorganic compounds which comprise about 4 – 6 % of the total body weight. They are non-caloric, with ash as their end product, unlike organic compounds (protein, fat, and carbohydrates) with carbon dioxide, water as the by-products.

Classification

- A. Minerals are classified as microminerals and macrominerals.
- B. Macrominerals are those whose occurrence in body weight is greater than .005% while microminerals are those whose occurrence in body weight is .005% and below.
- 1. Macrominerals include calcium, phosphorous, potassium, sulfur, sodium, chlorine, and magnesium. Microminerals include iron, zinc, selenium, manganese, copper, iodine, molybdenum, cobalt, chromium, and fluorine.

Functions

Minerals in general help in the following:

- B. Structural function – integral part of the cell, tissue, substances or organic compounds in the body
 - bones and teeth- calcium, phosphorous, magnesium, fluorine
 - hair, nails, skin – sulfur
 - hemoglobin – iron
 - glandular secretions- HCl of gastric juice
 - thyroxin – iodine
 - insulin – zinc & sulfur
 - vitamin B12 – cobalt
 - soft tissues- mainly muscles- all salts e.g. potassium, phosphorous & sulfur
 - extracellular fluid – sodium and chlorine
- C. Regulatory function – include
 - contractility of muscles- all particularly calcium, sodium and potassium
 - irritability of nerve - all particularly calcium, sodium and potassium
 - normal blood clotting- calcium
 - maintenance of acid-base balance – sodium, potassium, calcium, magnesium, phosphorous, sulfur and chlorine

Sources

Milk, fish, leafy vegetables, seafood, dried fish, legumes, nuts, meat, poultry, cheese, and dairy products are good sources.

C. Apply the principles in Food Selection, Cookery, Table Setting and Serving

Food Selection

- 1. Exercise firmness and control in making decision in choosing what to buy based on nutritional quality, health, and safety of family and the family likes and values.
- 2. Establish the habit of buying foods of the best quantity at the most reasonable price.
- 3. Appreciate the use of proper substitute when original ingredients are not available or too expensive to buy.
- 4. Make it a habit of reading labels to get information about the product.
- 5. Practice allowing more than enough time in choosing what to buy so you can compare common foods items and be able to select the best brand.
- 6. Control oneself in indulging in impulse buying and forgetting priorities when marketing stick to the market list no matter what.

Food Preparation

- C. Develop the habit of preparing all needed tools, equipment, and ingredients before starting to cook.
- D. Practice all nutrient conservation measure to safe keep nutrient in food.
- E. Appreciate a well prepared nutritionally adequate and aesthetically prepare meal.
- F. Adapt absolute hygiene in the preparation of food.
- G. Exhibit a positive attitude towards work. Food preparation is a tiring but rewarding task.
- H. Exercise patience and creativity in preparing food that is acceptable and appreciated by the family.
- I. Adopt scientific attitudes in preparing and cooking food using the right quality of ingredients, correct measurement, correct temperature and correct procedure.

PROPER WAYS OF HANDLING FOOD IN PREPARATION AND COOKING

- 1. Food Purchasing
 - * Buy from a reliable or reputable suppliers
 - * Read label and watch for government stamp or symbol of approval
 - * Use pasteurized dairy products and read dates of expiration.
 - * Do not buy crack eggs, defective cans, broken seals from bottles, spoiled meats or fish, moldy breads, fruits and vegetables.
 - * Observe you vendor's sanitary conditions in the store.
- D. Food Storage
 - 1. Check you refrigerator temperature (maintain at 35 to 40 °F).
 - 2. Check your freezer temperature (keep at 0 or below 0 °F).
 - 3. Cover and wrap food properly; label with the product name and date when stored
 - 4. Keep cooked foods on shelves above raw foods. Avoid drippings.
 - 5. Store in small batches to cool or freeze faster.
 - 6. Allow space around food packages or containers for air circulation.
 - 7. For dry storage (flour, sugar, rice, dried beans etc): store in a cool, dry place 6 inches away from the floor and 12 inches away from the ceiling. Keep dry, clean containers properly labeled and tightly covered; they should not touch the walls.
 - 8. Use FIFO (First In, First Out) METHOD of using stored foods.

1. Cooking Food

- ☐ Thaw frozen foods in the refrigerator, microwave oven, or as part of its cooking period.
- ☐ Follow the principles of cooking for the type of food. Cook meat and fish thoroughly.
- ☐ When tasting food, use spoon once.
- ☐ Avoid smoking and chewing gum while cooking. Minimize talk.

Cooking Guidelines for Foods

Type of Food Serving	Internal Temperature		Allowed time before serving #
	°F	°C	
Beef roast (rare)	130	54	121 minutes
Beef roast (medium)	145	63	3 minutes
Eggs	145	63	15 seconds
Pork products	160	70	15 seconds
Poultry, stuffed meats	165	74	15 seconds

AReference: FDA 2002. Food Code of the USA,Washington, DC

Held at internal temperature

A Cooling and Reheating

- Cool foods within two hours from 140 °F down to 70 °F then to 40 °F.
- Cool food in shallow containers. Food should be no more than 2" deep. Stirring periodically speeds up the cooling process
- Leave container open until the food has cooled.
- Reheat food to at least 165°F
- Reheat gravies, sauces and soups to a boil

B Serving Food

- Observe personal hygiene: clean body, properly washed hands, clean attire, clean hand towel and apron.
- Tableware, linens (tablecloth, napkins) should be cleaned and sanitized.
- Finger should not touch glass rims, fork tines and spoon wells.
- Handle plates, saucers and cups at edges or away from the food served.
- Avoid touching your hair, skin and nose. Wash hands again after touching any part of your body.

C Dishwashing

- Scrape and pre-rinse
- Wash in hot, soapy water (120 °F), using food detergent.
- Rinse in running hot water at 170 °F or lower (120 °F) if chemical sanitizer is used.
- Air-dry. Store in clean cabinets or shelves away from pests and dust.

Nutrient Conservation in Food Selection, Preparation and Cooking

- Nutrients are found in the skin or just beneath the skin. Wash before paring and cutting. Serve immediately after slicing.
- Peel fruits and vegetables thinly.
- Prepare fruits and vegetables such as side dishes, juices, and salads only at the time needed. Don't prepare several hours in advance. As they are exposed to air and light, they losses nutrient content as well as aesthetic appeal.
- To prevent the darkening of certain fruits such as apples, bananas and mangoes, soak in calamansi, lemon, or pineapple juice.
- Cook at the shortest time possible. Steaming, waterless cooking and pressure cooking are recommended methods because nutrient losses reduced.
- Avoid thawing and refreezing of frozen foods. Frozen foods when allowed to warm at room temperature and then refrozen can cause much nutrient loss.
- When cooking frozen vegetables place directly in boiling water. Do not thaw anymore.
- Use small amount of water when cooking vegetables. The water used in cooking should not be thrown out. It could be used for sauces & soups.
- Pot should be kept covered while cooking vegetables to prevent evaporation and oxidation of nutrients.
- Avoid using baking soda in cooking vegetables, while it preserves the green color, it also destroys the vitamins.
- Wash rice once or twice. Use the rice washing for soups to utilize nutrients in the washing.
- Fry meats, fish, and poultry at low temperature to make the protein content digestible. In frying keep fat below smoking point because overheating makes it bitter and irritating.
- When cooking hard-cooked eggs, cool immediately to prevent the discoloration of the yolk. The discoloration is due to the iron that accumulates in the periphery upon cooking; when cooked rapidly these will diffuse back in the yolk.
- In preparing green salads, wash greens in running water. Place in covered plastic containers then cool in the refrigerator overnight. This will make the green crisper. Salad green may be prepared a day before and kept without dressing.
- Dovetail and synchronize work whenever feasible.

THE PLACE SETTING OR TABLE COVER

The space used by one person at the table is referred to as a —coverll. A width of at least 20 inches should be allowed for each cover, and an even greater width is desirable if the table is large enough. A simple decoration will help to make the table attractive.

How to place the table covering

If a tablecloth is used, place it over a silence cloth or pad, and center the cloth evenly on the table. If placemats are used, put one at each cover so that each mat is straight along the edge of the table and about ½ to 1 inch from the edge. Napkins go to the extreme left of the

cover with the open edge of the napkin either to the right or to the left and about 1/2 to 1 inch from the table's edge. When there is not room for the napkin at the left, it may be placed in the center of the cover.

How to place the tableware

Flatware is placed at each cover in the order in which it is to be used, from the outside in, and about 1 inch from edge of the table.

Place the forks, with the tines up, at the left of the cover, and place the knife, with the cutting edge toward the inside, at the right of the cover. Then put the spoons, with the bowls up, at the right of the knife. If no knife is required at the meal, as for example when a salad is served with a prepared sandwich for the main course, the salad fork is placed at the right of the cover instead of at the left. Butter spreaders are placed across a bread- and-butter plate, if one is used, either parallel with the edge of the table or parallel with the rest of the silver.

When the meal is to be served at the table, the serving pieces should be placed conveniently near the person who is to serve. Place the carving knife and fork and serving spoons at the right of the cover of this person, putting the carving knife at the right of the serving fork and the serving spoons at the right of the knife. Or if the table is a small one, place the carving knife at the right of the serving platter with the serving spoons beside it, and the serving fork at the left of the platter. The serving platter will be at the top of the platter. The serving platter will be at the top of the server's cover.

How to place the glassware:

Tumblers or goblets are placed just above the knife, either directly in line with it or slightly at the right of the tip of the knife. If two glasses are needed, place the second glass at the right of the water glass. Glasses of very cold beverage, may deposit moisture on the table covering so put a coaster or a small plate beneath them. For iced beverages, the coaster or under plate should be large enough to hold the spoon that is used for stirring or at least to support the tip of the spoon when it is not in use. When a juice or cocktail is served as an appetizer, put the filled juice or sherbet glasses on place one in the center of each cover, except at breakfast, when juice glasses may be put at the right of the water glasses.

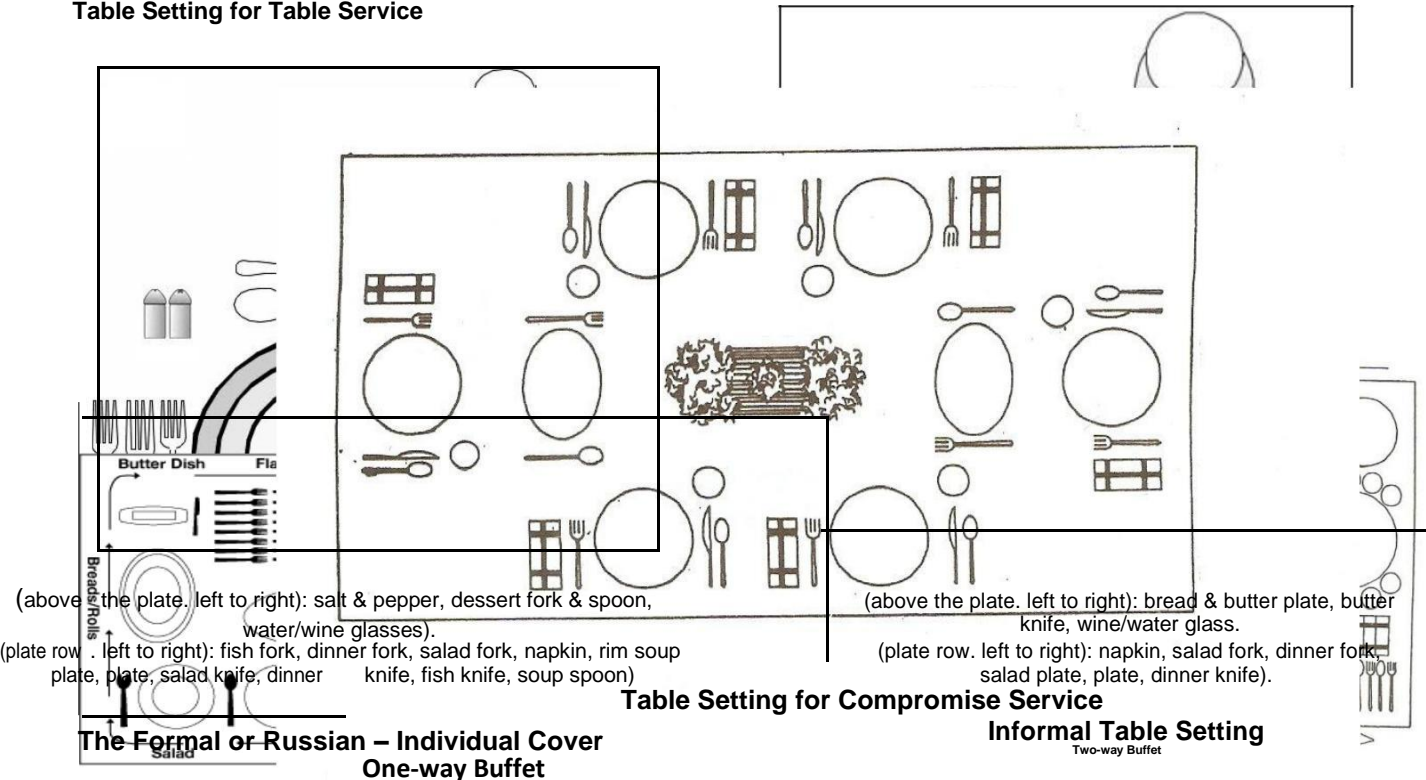
How to place the dinnerware

If bread-and-butter plates are used, they are placed at the tip of the fork. When the food is to be served from the table, place the plates for each course before the person who will serve. If the food is to be passed so each person may help himself, then put a plate at each cover.

If a hot beverage is to be served at the table, place the cups and saucers before the person who will pour the beverage, either at the right or left according to the amount of space. Each cup should be on its own saucer with the handle of the cups at the right. When there are more cups and saucers than can be arranged this way, one cup may rest inside another with the two saucers under them, but no more than two cups should be stacked together.

Put the salad plates next to the salad bowl if the salad is to be served from the bowl. Or put an individual salad plate that has been served in the kitchen at the left of each cover. When the table is small, it is permissible to place the salad plate at the top left. Or even at the right should that be more convenient.

Table Setting for Table Service



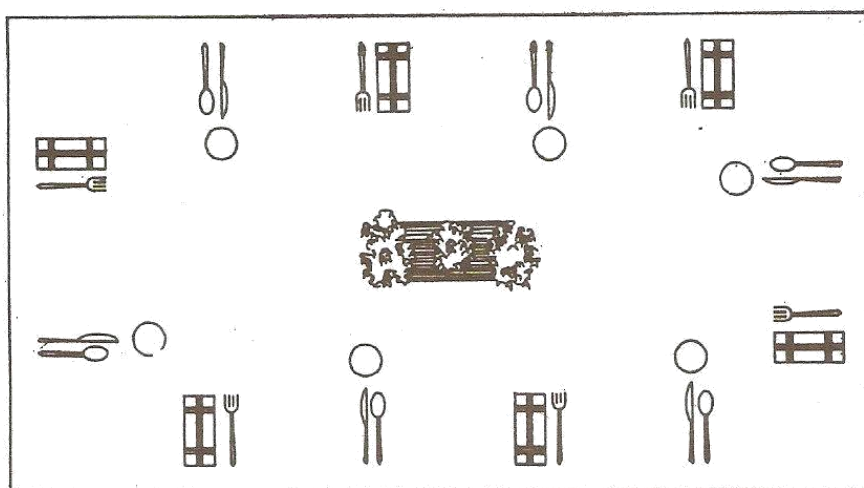


Table Setting for Blue Plate Service

D.PREPARE A LOW COST BUT NUTRITIOUS MEAL

Low Cost Adequate Meals

1. What to consider:

Consider foods that are inexpensive but contain relatively great amounts of nutrients.

Make an update of current prices in the market and foods in season and know where to buy to get the good buys.

Choose and combine nutritionally economical foods to arrive at low cost adequate meals.

The foods which could be considered nutritionally economical include the following:

For Group I or Body Building Foods – tagunton, shrimp, green monggo, dilis, alamang and tulingan. For Group II or the Body Regulating Foods – papaya, tomatoes, malunggay, dahon ng sili and alugbati.

2. How to Plan

Make a listing of nutritionally economical foods.

Come up with the nutritional requirements of each and every member of the family.

Nutritionally economical foods must be combined in the best way possible, with considerations for the proper bulk,

the usual pattern, food preferences, as well as resources available for the preparation of such

meals. Minimizing Cost of Meals

3. Keep food cost within the budget

4. Minimize food cost in meal planning:

Include foods in season

Include easily available foods

Consider appropriate substitute

Use dried fish or beans to extend meat supply; extend rice with corn and root crop.

Utilize leftover foods if there are any.

Use expensive dishes and one dish meals where feasible.

Serve more fruit/fruits juices or root crops rather than processed junk snacks.

Plan a menu in advance and take time out to give it a thought.

Plan on foods liked by the family.

Plan baby's foods from family pot.

Plan within available resources.

Be innovative and resourceful. Have your tools on hand (i.e., recipe, guides, etc.,)

Food purchasing also affects the food cost. In shopping, it is advised that the menu planners should:

Prepare shopping list; shop alone.

Shop according to available facilities.

Know the guide to purchasing (right quality and specifications).

Know current cost of item.

Read labels and check weights of food.

Don't over buy.

Exercise appropriate scheduling.

E. Apply the Basic Skills in Baking and Cake Decorating

PRINCIPLES IN BAKING

Maintain hygiene and sanitation at all times. This means keeping oneself, the food, tools and utensils and the surrounding clean.

Know the kind of flour to use in every type of baked product. Cake flour is ideal for cakes, bread flour for practically all bread and all-purpose flour for cookies and pastries. While substitution can be made in the absence of one type, it is always best to use the ideal type.

Batters and dough differ in terms of the ratio of liquid to flour

1. Mixing techniques such as creaming, folding, beating, kneading, and stirring affects flour mixture and the resulting baking products.
2. Degree of mixing may alter viscosity or fluidity and texture of the finished product. As a general rule, breads need thorough kneading for highly developed gluten. Cakes need just enough mixing for a well-blended batter while pastries require a special technique in mixing such that some amount of gluten is developed but the dough retains its characteristics of flakiness and tenderness.

3. Optimum mixing time varies with each recipe according to ingredients, their proportions, temperature, and types of mixing. Optimum mixing is defined as that which partially or completely dissolves sugar, develops gluten framework, distributes fat throughout and yield the best flavor, texture and volume.
4. Ingredients combined in a product react differently at various temperatures. At higher temperature, sugar becomes soluble, fat spreads faster, and flour absorbs water rapidly. The degree of heat to which batters and dough are subjected varies with altitude above sea level. The higher in elevation, the lower the temperature of boiling water, hence the need to adjust by increasing the temperature. Normally, the reduction is 2°F at 1,000 ft. elevation so that the baking temperature is increased accordingly to bake the product thoroughly.
5. The rate at which boiling point of water is reached within the baked product depends on oven temperature, the ingredients, size and shape of pan.
 - Softly spongy crumb like biscuit, bread, cakes do not reach internal temperature above boiling point.
 - Crisp, brittle or rapidly baked product like cookies and crackers require internal temperature above higher than boiling temperature.
 - If oven temperature is too high the crust forms too fast limiting the expansion of the leavening gas or reducing its volume
 - If oven temperature is too low the dough dries out and the temperature in the interior does not rise quickly to set the gluten thus limiting its volume.
6. Use pan size called for it in the recipe for good size, shape, and contour. Baking pan with straight sides gives a more velvety texture.
7. Sift flour before measuring when recipe calls for it.
8. Pack sugar firmly and level off.
9. Baking pans made of aluminum or tins distribute heat evenly and give a delicate golden brown crust to cake.
10. Two types of cake formulas are the butter or shortened cake and foam or unshortened types of cakes. Butter is reasonably high in fat while foam type depends on egg protein for the bulk of its volume.
11. Shortened cakes / butter cakes include pound cakes and the yellow, white, spice, and chocolate cakes used in everything from wedding cakes to traditional layered birthday cakes. These cakes use butter, shortening, or oil for moistness and richness and are leavened with baking powder and/or baking soda.
12. Examples of unshortened cakes are sponge cakes which achieve their high volume from beaten eggs rather than a leavening agent like baking powder. Sponge cakes do not contain butter, shortening, or oil. Angel food cakes are the most popular and are literally fat-free since they use only egg whites, not egg yolks. Yellow sponge cakes are prepared with whole eggs. Chiffon cakes are also lightened with beaten eggs, but they are not true sponge cakes because they contain vegetable oil.

Definition of Terms

Bread Making

Fermentation - allowing dough to rise at a specific period of time.

Rest - allowing dough to relax for several minutes for easy kneading.

Kneading - applying massage to dough to create an elastic effect due to gluten content of flour.

Dough - a mixture of yeast, flour etc. form together and raw.

Bread - a finished product after dough is baked.

Cake Making

Sifting - allowing to filter all dry ingredients for a good homogenous mixture.

Batter - a mixture of dry and liquid ingredients and raw.

Cake - a finished product after batter is baked.

Pastry Making

Dough - a mixture of raw ingredients formed together.

Pastry - a finished product after dough has been baked. The difference between bread and pastry are its texture and taste. Fat based and has a minimum amount of water content which creates a flaky effect.

Crust - a layer of a pastry.

Dry Ingredients in Baking

Dry ingredients include flour, sugar, milk powder, and leavening agents such as baking powder, baking soda, and cream of tartar.

Knowing and understanding the nature and characteristics of each of these dry ingredients is basic to the acquisition of skill in baking.

Flour

Flour is the major ingredient among all other ingredients. It is a powdery product obtained from milled cereals, foremost of which is wheat. Flour provides the structure of baked products. It also contributes to color, texture, and flavor. Other products include cassava flour, rice flour, soya flour, potato flour, mongo flour, and several others. Flour used in most baked products is wheat flour.

There are three (3) kinds of wheat flour:

1. **Bread flour** – Also known as strong or hard flour. It has 12–14 % gluten content. Bread flour has a coarse texture. It feels gritty, sandy, dry, and granular. It has a creamy color and it usually does not lump when pressed together. This type of flour is ideal for making breads, rolls, and other sweet yeast-raised products.
2. **All purpose-flour** – Also known as general flour or pastry flour. It has 10-11 % gluten content. It is a combination of bread and cake flour. Hence, it is used as a substitute for making breads, cakes, and pastries. For bread making, it requires more kneading to develop its gluten and in cakes, it requires less mixing to control gluten development.
1. **Cake flour** – Also known as soft flour. It has 7-9 % gluten content. It is ideal for cakes, cookies, pastries, and crackers. This flour has a velvety and smooth texture, is whiter than the two other types, and tends to hold shape when lumped together.

Sugar

This is a sweet, crystalline, soluble compound that comes from the processing of sugar cane and sugar beets. It is available in the market in different forms.

1. **Brown sugar** – this sugar comes from different shades of brown depending on how well it has been processed. The darkest brown sugar is usually sticky, lumpy, and contains more molasses than the brown and light-brown types. Unlike white sugar, it contains some caramel, mineral water, and more moisture. Brown sugar is less purified than white sugar.

2. White, granulated sugar – This is the type commonly used by bakers in practically all baked products and in preparing varieties of icings, fillings, etc. it varies in texture, from coarse to sandy, to fine and smooth.
3. Confectioner's sugar – This sugar is the finest in texture compared with brown or white sugar. It contains about 3 % cornstarch. This prevents the lumping or crystallization of the sugar granules. This type of sugar is used mostly in icings and in cake mixes where a blending of flour and sugar is done and then added in the final stages of mixing.

Other types of sugar include:

- a. Panutsa – A solid mass of crude sugar usually in half coco shell shape.
- b. Lump sugar – This sold in the market in cubes. It is white and porous.
- c. Molasses – This is unrefined sugar that is liquid in form, black in color, and very thick in consistency.

Sugar contributes to the browning of the crust. The intensity of its brownness depends on the amount and kind of sugar used. As the amount of sugar is increased, the brown sugar becomes darker. Likewise the bread is baked in a shorter time to retain its moisture. A rich brown crust adds appeal and palability to the baked product.

Leavening Agents

These are substances that produce gas while mixing or heating the dough or the batter. When gas is produced, the product increases its volume and becomes light and porous.

There are three (3) groups of leavening agents. They are air, water or steam, and carbon dioxide.

1. Air is incorporated in several ways when one creams the butter and sugar; eggs are added one at a time while mixing; the batter is folded into the whipped egg whites, or egg whites are beaten with a whisk beater;
2. Steam or hot water vapor causes the mixture to rise as in steamed Puto and Siopao;
3. Carbon dioxide is produced by the use of yeast, a biological leavener; baking powder and baking soda which are chemical leaveners.

Leavening agents are used in almost all baked products because they make baked products light, due to their open and porous texture. The products become:

1. bigger in volume due to the air cells
2. light due to its porous texture
3. easily chewable due to its light and porous characteristics

Leavening agents such as baking powder, baking soda, and cream of tartar should be kept in tightly lidded containers. These containers should be in a clean, cool, and dry place. Exposure to heat leads to rapid deterioration. Yeast should be kept in a cool place in a tightly closed container.

Salt

A minimal amount of salt (about 2% of the weight of the flour used) is recommended in yeast bread. Salt used should be cleaned and refined. Salt serves several purposes in baked products.

- 1 It enhances the flavor due to contrast of saltiness and sweetness.
- 2 It removes the flat taste of food.
- 3 It controls yeast activity so that production of gas is also controlled.
- 4 It strengthens the gluten in the dough.
- 5 It modifies the color of the crust in the yeast breads.
- 6 It helps prevent growth of undesirable bacteria in bread.

Liquid Ingredients in Baking

Liquid ingredients include water, milk or cream, and fruit juices. In baking, it is added to flour to develop the gluten. *Gluten* is the elastic substance from the protein components of the flour namely glutenin and gliadin. The amount of water in flour influences its consistency. Too much water weakens and tends to spread the gluten. On the other hand, too little water makes the dough stiff and difficult to handle. The amount of water used depends partly on the types of flour used. Bread flour absorbs more of water while cake flour absorbs less water. Therefore, the proportion of water to flour is in a ratio of 1:2 ½ cups for bread flour, 1:2 for cake flour, and 1:3 for all-purpose flour.

Liquid ingredients are important in baking for the following reasons:

2. They are integral components in the preparation of batters and dough.
3. They add flavor as in milk and juices.
4. They contribute to the volume and texture of the products.
5. They promote the growth of leavening agents like yeast as in lukewarm water.

Fats, Oil and Other Ingredients

Fats and oils are the same in chemical composition but differ in appearance. Fats are solid while oils are liquids. Fats are either visible or invisible. Visible fats, which can be seen by the eye, are butter, pork fat, beef fat, and oils used for salads, frying, and other cooking.

Fats come from animals and vegetables. Bacon oil and butter come from animals while coconut, peanut, soya beans, and corn oil come from vegetables.

Invisible fats are not seen by the eye but can be recognized due to their greasiness or oiliness. Examples are egg yolks, avocado, lean meat, and cheese.

Fats and oils are used in foods for different purposes:

1. For table use – example are margarine, butter, and cheese
2. For cooking – like coconut oil, peanut oil, corn oil
3. As shortening in cakes in pies
4. As salad dressing as in mayonnaise and French dressing

Uses of Fats in Bread and Cakes

1. For all types of yeast bread
 - It contributes to tenderness of the product.
 - It improves the flavor of the bread.
 - It helps in retaining gas in the dough, thus giving it a better volume and crust.
 - It lubricates the gluten strands, producing better layers.
 - It gives the product better flavor.
2. For cakes
 - Because of its good creaming property, it helps in incorporating air in the mixture, thus giving the cake better volume;
 - Because of its emulsifying property, it allows the water-in-fat and air-in-fat emulsion which makes the product more tender and better texture;
 - It gives the product better flavor; and
 - It allows easy slicing or cutting of cakes due to separation of gluten strands.

Uses of Eggs in Baking

Eggs have varied roles in baked products. These are the following:

1. Leavening – When egg white is beaten, the foam consists of many air bubbles each surrounded by a film of egg protein. The mechanical action of beating and contact of the thin protein films with air partly coagulates the protein and make the foam stable. On baking, the air bubbles expand with heat and the protein film is sufficiently elastic to stretch. Overbeating incorporates too much air thus stretching the albumin so that it becomes thin and possible collapse of the foam may take place. Thus, overbeating beyond the stage appropriate for a particular use should be avoided. Beating may be accomplished with the use of manual or electric egg beater.

Slightly beaten egg white is frothy or slightly foamy, transparent and flows easily, and has large air bubbles. It is usually used for thickening.

Stiff egg white has lost its frothy appearance but still foamy; has small air bubbles; is no longer transparent but is opaque white, very shiny, and moist, and flows if the bowl is tipped. If allowed to stand, the liquid portion of the stiff foam separates out readily. It is used for stiff meringue.

Soft egg white is no longer foamy but moist, shiny, smooth opaque white, and has tiny air bubbles. This is the stage of beating that is often used. It is usually used for meringues and cakes. It should be noted that the stability of egg white is important in the success of cake products such as angel cake.

Dry egg white is white but dull. It is avoided in meringues or cakes because the stability is decreased. If allowed to stand, the liquid portion separates.

1. Color – The yolk of the egg provides the desirable yellow color that gives the cake a rich appearance.
2. Richness – Fats and other solids of the egg provides the product additional fat and sweeter taste. It also provides shortness in the mix, enabling the mixture to be handled easily.
3. Flavor – The odor of the egg gives a desirable aroma to the baked products.
4. Freshness and Nutritive Value – Egg retards staling because of its moisture content (75% for whole egg) and its natural ability to bind and retain moisture. Egg has high nutritional value. It is rich in calcium, phosphorus, and iron. The protein in egg is complete protein, capable of supplying all the essential amino acids required to maintain growth and good health. In addition, the use of egg supplies important amounts of Vitamin A, D, thiamine, and riboflavin.

Weights, Measurements, and Substitutions

Accuracy in measuring baking ingredients produces good quality products. Behavior of ingredients when combined in a recipe is not only dependent on the kind of ingredients used but also on the amount of these ingredients. Measuring the right amount of ingredients depends largely on using standard measuring tools and the correct technique in measuring so that accuracy is obtained. Three methods commonly used in measurement are by volume, by weight, and by unit. Standard measuring spoons and cups are examples of tools for volumetric measures. The weighing scale is a tool for weight measure.

Common units of measurements for volume include the following:

1 teaspoon (t) = 4.9 milliliters

1 tablespoon (T) = 3 teaspoons
= ½ fluid ounce

1 cup (c) = 16 tablespoons
= 48 teaspoons
= 8 fluid ounces

1 pint (pt) = 2 cups

1 quart (qt) = 4 cups

= 2 pints

1 gallon (gal) = 16 cups

= 8 pints

= 4 quarts

1 peck (pk) = 8 quarts

1 liter (l) = 1000 milliliters

= 1.06 quarts

Common units of measurements for weights are the following:

1 gram (g) = 0.035 ounces

1 kilogram (kg) = 2.21 pounds

1 ounce (oz) = 28.35 grams

1 pound (lb) = 453.59 grams

Substitution of Ingredients in Baking

Substitutions are ingredients that take the place of the ingredients originally required in a recipe. They are made when the ingredients are not available or are expensive. When the right substitutions are made, the same quality product is produced. By right substitution is meant the right kind and the right quantity of the substitute. Some common substitutions are the following:

All-purpose flour	1 cup sifted	1 cup all-purpose flour minus 2T 1 cup + 2 T cake flour
Cake flour	1 cup sifted	1 cup minus 2 T sifted all-purpose flour
Buttermilk	1 cup	1 cup milk minus 1 T + 1 T vinegar
Corn syrup, light	1 cup	1 cup sugar plus ¼ cup water
Chocolate unsweetened	1 ounce	3 T cocoa + 1 T fat
Cream	1 c	¾ c milk + 1/3 c butter or margarine
Honey	1 cup	1 ¼ cup sugar + ¼ c liquid (any liquid required in the recipe)
Milk, whole	1 cup	1/3 c nonfat dry milk + water to make one cup + 2 T fat ½ cup evaporated milk + ½ cup water

Correct technique in measuring is as important as using the standard tools in measuring to obtain accuracy. For instance, the correct technique in measuring sifted flour, white sugar, powdered chocolate, and dry milk is simply to fill up the cup or spoon without topping or pressing and level with a spatula. Shortening (lard), margarine, butter, and brown sugar are packed into the cup by pressing until all spaces in the cup have been filled up and the substance retains its shape when removed from the cup. For a liquid, it is important to place a cup on a leveled surface. The liquid is poured into the cup until the required amount is reached. Marker lines on the cup indicate fractional parts of a cup. They serve as boundary lines indicating whether a fractional part is filled up. For instance when ½ cup is needed, the cup is filled up to the line indicating ½.

Baking Tools and Equipments

One factor in successful baking is using the right kind of tools and equipment. Not only should the tools and equipment be of the right kind but they should be efficient as well. For instance, a knife must be sharp to cut well, a measuring cup should be well-formed not deformed, and the oven should have temperature control and must be functioning well.

Different tools perform different uses. Use the right tools for the right job.

For Measuring
Set of measuring spoons
Set of measuring cups (nested) for dry ingredients
Liquid measuring cup (made of glass)
Weighing scale

For Cutting, Mixing, and Blending	
Grater	Rolling pin
Cutter, for dough and for pastry	Wire Whisk beater
Mixer, electric and hand	Rubber Scraper
Pastry brush	Cookie cutter
Sifter, wire or plastic	Spatula
Pastry blender	Wooden spoon

For Cooking and Baking	
Baking Pans	Cookie Sheets
Loaf pans	Ovenproof glass wares
Jelly roll pan	Saucepans
Rectangular pan (of varied sizes)	Kettle, casserole, frying pan
Round pans	Double boiler
Tube pans	Steamer
Square pans	Oven – native oven (fueled with
Muffin pans	charcoal, wood shaving, or rice

Other Tools and Equipment	
Pastry clothes	Custard cup
Spatula	Table knife, fork, and spoon
Cooking rack	Utility tray, cups, and saucers
Ring mold	

The functional life of baking tools and equipment depends on the care and maintenance. It is not enough that they are used properly but care given after use is very important to last for a long time. To replace them would be expensive, and if you are in the baking industry, this would cut on the profit.

Different baking tools and equipment are made of different materials requiring different care. The following are general guides in the care of baking tools and equipment.

- A. Clean tools and pans made of aluminum with soap and water. Avoid using scouring pad as this will scratch and darken the metal.
- B. Stainless ones should be cleaned with soap and water, too. Use a very mild scouring pad and powder to remove stubborn dirt. A clean dry cloth can bring out the luster when clean.
- C. Glassware should be cleaned with warm soap and water. A fine scouring pad can be used to remove stubborn dirt. Pat dry with dry clean cloth. Kitchen towels can bring out the luster in glass.
- D. Cast-iron made equipment like the carajay can be scoured with a scouring pad (plastic or fine steel) to clean well. Rinse and dry thoroughly.
- E. Soak any tool and equipment with stubborn dirt for easier cleaning. Use warm water for burnt food like sugar and cool water for cooked starch or flour.
- F. Always use clean and absorbent rags in wiping tools and equipment. Air-dry them whenever possible. Remember that equipment dries quickly when rinsed with hot water.
- G. Store tools and utensils dry, clean, and in good condition.
- H. Keep spatulas, beaters, and whisks clean. Hang them.
- I. Set pans and cover upside down when storing. Likewise bowls should be kept nested to save space.
- J. Hang those which can be hanged.

Methods of Mixing Batters and Dough

The purpose of proper mixing of batters and dough is to blend the ingredients and to develop the gluten, the elastic protein component in flour.

The four (4) methods of mixing batters and dough are:

- A **Conventional Method** - Fat is creamed sugar and is added gradually. Eggs are added one at a time to the creamed mixture. Sifted flour and other dry ingredients are then added alternately with the liquid ingredients into the creamed mixture. For much lighter cakes, the egg whites may be separated and beaten until slightly stiff and the batter is folded in to the egg mixture.
- B **Muffin Method** – The dry ingredients are sifted together in one bowl. In another bowl, fat/ oil is added gradually to beaten eggs. This is now added gradually to the dry ingredients in the other bowl. Uniform mixing is done to allow a smooth blending of ingredients.
- C **One-Bowl Method** – The sifted dry ingredients are placed in a bowl. A well or hole is made at the center. The liquid ingredients such as egg whites, oil, puree, or water are placed in the well and then blended. Mixing direction is one way to follow the incorporation of air. Egg whites are beaten separately and then blended with batter to create a better volume of the product.
- D **Pastry Method** – Sifted dry ingredients are placed in a bowl and hydrogenated fat is mashed lightly in the dry ingredients with the use of a fork. Or the fat can be cut lightly into the dry ingredients are moistened. Mixing is controlled to avoid full development of gluten. This is good for pie crust, biscuits, and other pastries.

Other than the general mixing methods used for cakes and pastries, there are several mixing techniques used by seasoned bakers for producing better-quality products. These techniques are used every step of the way, that is from measuring down to baking. Let us study some of the techniques.

- C. **Measuring** - Accurate measurement come with proper handling of tools and equipment. To measure dry ingredients like flour, white sugar, or baking powder, always spoon the ingredients lightly into the container until it overflows. Then level this with a spatula or any tool with straight, smooth side. In the case of shortening and brown sugar, it is important to press down the ingredients, see to it that the glass measuring cups is placed in a leveled surface. Then pour the liquid into the cup until it reaches the desired measurement. Proper technique in measuring assures accuracy of measurement hence, the right proportion of ingredients is achieved.
- D. **Creaming** – When shortening or butter is creamed in a bowl, it should be at room temperature or slightly below room temperature to achieve a smooth texture. Sugar should be added gradually to the creamed butter until a smooth and fluffy consistency is achieved.
- E. **Cutting in** – This involves fat or shortening being cut into the flour as in pastry making. A pastry blender or two knives can be used to cut through the ingredients until the flour is moistened and a coarse, granular mixture is formed. Avoid overmixing. It develops the gluten and what comes out is tough, elastic dough instead of a flaky and tender pastry.
- F. **Folding** – This is an important process in the mixing of a beaten egg whites into the batter. Care should be taken to incorporate and retain the air produced in the folding process – one swift cutting stroke going down and a gentle horizontal move at the bottom then swiftly going up. Maintain a uniform light movement of your strokes until a thorough blending of the beaten egg whites and batter is achieved. Folding is best done with the use of a rubber scraper than with one's bare hands. However, for bigger mixtures an electric mixer or the hands may be used.
- 3. **Beating** – If the purpose of beating is to incorporate air, it is best to use a wire whip or a whisk beater. The looped wires are excellent tools for blending and incorporating air, especially in egg whites. Beat with a uniform motion, starting slowly then gradually increasing speed. For better results, see to it that the egg whites are fresh, free from egg yolk mixture, and are at room temperature.
- 4. **Kneading** – This is a process involving pressing, pushing, folding, and stretching of the dough. The purpose of this is to develop the gluten to give the dough a better structure, a smooth texture, an elastic consistency and a bigger volume.
- 5. **Stirring** – This is a process of mixing two or more ingredients. This is usually done by agitating the ingredients in a bowl or container. The tool usually used is a wooden spoon. The spoon is moved in a circular motion. The amount and intensity of stirring depends on the degree of consistency and the texture required. However, it is good to remember to stop stirring as soon as the ingredients are well mixed.

Mixing techniques affect the character of the finished product. In cake batter, for example, overmixing produces a smooth but tough product. Undermixing, on the other hand, prevents the development of a tough gluten. Such difference accounts in part for variations in cakes or pastries from the same recipe but with results not always the same in different bakings. The method of mixing, mixing technique, time, and temperature among others, affect the finished product.

Working with Ingredients

Consistency and texture of the finished product depends largely on the proportion of dry ingredient to the liquid ingredients . In batters and dough, this depends on the ratio of flour which is the major dry ingredient to liquid such as eggs, oil, milk, juice, or water. Batters are classified either as pour or drop batters. Dough are classified as either soft or stiff dough. Products for each class include the following:

- Pour batters – pancakes / crepes, cream puffs, and waffles
- Drop batters – cookies, biscuits, muffins, cakes
- Soft dough – all kinds of soft rolls, soft bread, and roll biscuits.
- Stiff dough – stiff bread, crust of pies, wheat flour noodles like miki, macaroni, spaghetti, etc.

Proportion of Flour to Liquid

Type	Ratio of Flour to Liquid	Consistency
Pour batter	1:1	Pour is continuous and forms into a stream.
Drop batter	2:1	Pour is broken into drops
Soft dough	3:1	Sticky; shape not steady
Stiff dough	4:1	Firm; forms steady shape

Temperature

Temperature affects the interaction of ingredients in a mixture. This in turn affects the final structure of the product. This is true especially in cakes. For instance, when the temperature of fat is high, it tends to liquefy. It becomes less susceptible to creaming and in incorporating air. Hence, the product is less in volume, a bit heavy, and the mixture particles loosely knitted. Likewise, sugar becomes less soluble at lower temperature. Protein in flour absorbs water at a faster speed at high temperature.

Likewise, when sugar is at low temperature, it tends to be less soluble.

TECHNOLOGY AND LIVELIHOOD EDUCATION

Focus: Cosmetology

A. Explain the importance of good grooming for personal and professional development.

Good grooming is keeping oneself clean, neat and attractive. It involves personal hygiene proper care of the body and wear of clothes that are clean, neat and appropriate for the occasion. Good grooming not only enhances the personality but it can be used as an effective tool in establishing good relationship. A well-groomed person is liked and appreciated by everyone. In turn, one who is well-liked and appreciated builds self-confidence and radiates a feeling of security. It also helps one to look at life in a positive light is happy and tends to be productive.

Good grooming is not only important in improving one’s personal looks but should and must be part one’s professional development. Appreciation and respect of the person as a professional whether this be a teacher, a doctor, a lawyer, a fashion model, an executive, a public relations officer can be partly attributed to the way the person looks and carries himself.

Part of good grooming is caring for one’s hair, hands and feet. A hair that goes well with one’s face, smooth and clean looking hands and feet, well-trimmed finger nails and toenails contribute to a well-groomed physical appearance.

B. Apply the correct procedure in manicuring and pedicuring.

BASICS OF MANICURE AND PEDICURE

Manicure comes from the Latin word —*manus*” which means hands and —*cura*” which means care; it means care of the hands and nails.

Pedicure on the other hand, comes from the Latin word "*pedi*" meaning foot and "*cura*" meaning care. A pedicure helps foot health by preventing a number of nail diseases and disorders when done regularly.

Purpose of Pedicure/Manicure

1. To improve the appearance of hands and nails
2. To keep hands and feet clean, fair and in good condition
3. It prevents long nail formation
4. Prevent nail damage like fragile tips, splitting.
5. To feel comfortable

Equipment and Materials Needed in Manicure

1. **Equipment**
 - Manicure table and adjustable lamp.
 - Patron’s and manicure’s chair or stool.
3. Cushion or small pillow (8 x 12 inches) covered with washable slipcover or sanitized towel for the

patron's wrist arm.

4. Supply tray for holding the cosmetics
5. Finger bowl for holding warm soapy water.
6. Container for clean absorbent cotton.
7. Container for sanitizing solution.
8. Glass container for cosmetics and accessories.

B. Tools and Their uses

1. **Orangewood stick** – to loosen cuticle, to work around the nail, and for applying cream, oil, or solvent to the nail and cuticle.

Nail file – used to shape and smooth the free edge of the nail.

Cuticle pusher – to push back and loosen the cuticle.

Cuticle nipper – to trim the cuticle.

Nail brush – to clean the nails and finger tips with the aid of warm soapy water.

Emery board – to shape the free edge of the finger nails with the coarse side and level the nail on the fine side.

Nail buffer – use to smoothen the top portion of the nail plate

Nail cutter – to cut the nails

Tweezer – to gently lift small bits of cuticle

3. Cosmetics

Cuticle cream – used to prevent brittle nails and dry cuticle.

Cuticle remover – used to soften the dead cuticle around the nail

Cuticle Oil – used to soften and lubricate the skin around the nails.

Cuticle solvent – may contain 2 – 5 %of sodium or potassium hydroxide plus glycerine.

Nail whitener – applied as a paste, cream, or coated string, this consists mainly of white pigments (zinc dioxide or titanium dioxide). When applied under the free edge of the nail they keep the tip looking white.

Nail polisher – solvent containing acetone or other solvent is used to thin out the nail polish when it is thickened.

Nail polish – is usually prepared in the form of powder or paste. It smoothes the nail and also imparts a sheen to the nail during buffing.

Nail drier – is a fine spray which protects the nail against stickiness and dulling. Can be used either as a spray over the top coat or directly in the nail polish.

Base coat – is a liquid product applied before the liquid nail polish. With this applicator the nail polish adheres readily to the surface. It also has a hard glass which prevents the color in the nail polish from staining the nail tissue.

Top coat or top sealer – is a liquid applied over the nail polish. This product protects the polish and minimizes the chipping or cracking of the colored polish.

Nail strengthener – is a product designed to prevent the nails from splitting or peeling. It is applied to the tips of the nails only.

Hand cream and lotion – keep the skin soft by replacing the natural oil lost from the skin.

Abrasive - available as pumice powder and is used to smooth irregular nail ridges.

4. Materials

Absorbent cotton – to remove cosmetics on the nails

Soap – for finger rings

4. **Warm water** – for finger bath

5. **Towel** – use individual towel for each patron.

6. **Cleansing tissue to use whenever necessary.**

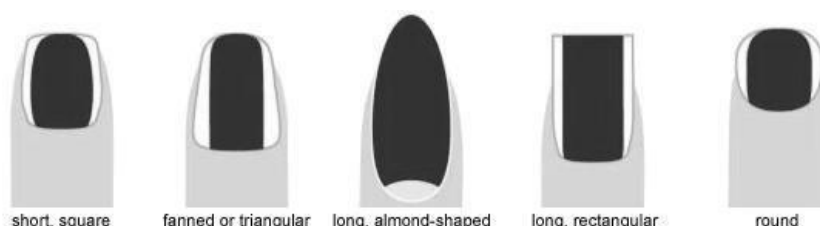
7. **Antiseptic** – used for minor injuries to tissues surrounding the nails.

8. **Disinfectants** – used to sanitize implements; to sponge the manicure table.

9. **Spatula** – used to remove creams from jars

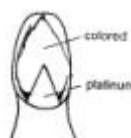
10. **Mending tissue and mending liquid** - to repair or cover broken, split, or torn nails

Different Shapers of Nails

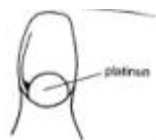


The shape of the nail should conform to that of the tips for a more natural effect. In general the long, almond nail shape, nicely rounded at the base and slightly pointed at the tips, fits most fingers and toes. Oval shape (long, almond shape file at the tip) is considered as ideal and the most perfect shape of the nail. If the form of the nail is small, almond shape is applicable. It makes the finger look normal in size.

A. Common Designs in Manicuring



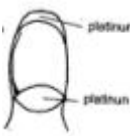
1.V-shape: colored, platinum



2. Half moon: platinum



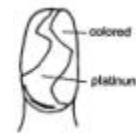
3. Plain with Tip: Platinum



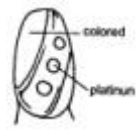
4. Half moon/tip: platinum, platinum

B. Decorative Designs

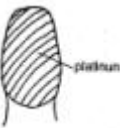
1. Elephant tusk: colored, Platinum



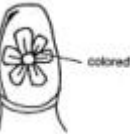
2. Ball with dot: platinum



3. Stripes: colored, platinum



4. Flowerette: colored



C. Fantasy Designs

These shapes are fun and great for party. Various arrangements of stripes and dots can be achieved by using cotton-tipped cuticle stick saturated with nail polish.



Application Techniques for Nail Color

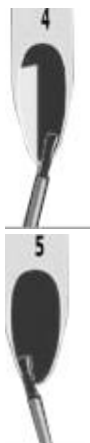


1. Test consistency of polish on nail tip before beginning.

2. Begin by applying polish down to the center of the nail in one stroke, from base to tip, leaving a small space between polish and cuticle.



3. Apply polish to cuticle base, stopping just short of the cuticle.



4. Lift brush and stroke one side of nail from base to the tip, avoiding the cuticle.

5. Stroke other side of nail from base to tip. If color has touched the cuticle or skin, wait until the polish has dried and remove with a cotton wrapped cuticle stick dipped in nail polish remover. To make your manicure last longer, apply top coat following the final coat of polish and allow to dry thoroughly.

Sanitary Care in Manicure / Pedicure

7. Sanitize used manicure implements and place them in clean cabinet sanitizer.
8. Place used materials like tissue paper, used cotton, used emery board, etc. in the trash can or close containers.
9. Wipe the top of the manicure table with disinfectant and put everything in order.
10. Clean the tops of nail polish bottles with polish remover.
11. Inspect the manicure drawer for cleanliness and order.
12. Wash and dry your hands.

Preparation for a Plain Manicure

Remove old polish – moisten a piece of cotton with the nail polish remover and press over the nail for a few moments to soften the polish. With the firm movement, bring the cotton from the base of the nails to the tip.

1. **Shape the nails** – Ask the patron, the shape she wants, then file the little nail of the left hand, from the little finger towards the thumb, in the following manner. Shape the nails into desired shape. Use the file or emery board to shape the nail. File each nail from corner to center going from right to left and then left to right. On each side of the nail, use two short, quick strokes and one long sweeping stroke.



3. **Soften cuticle** – After filling the sides of nails, then immerse left hand into finger bowl,



to permit softening of the cuticle. Then for few minutes remove the finger from bowl.

1. **Dry fingertips** – Wipe with towel on both hands, carefully dry the left hand including the area between the fingers. At the same time, gently loosen and push back the cuticle and adhering skin on each nail.



2. **Apply cuticle remover** – Wet the nail with cuticle remover around the edge of the nail, and push gently and carefully loosen dead cuticle, avoid too much pressure in pushing back the cuticle.



3. **Loosen cuticle** – Upon pushing the cuticle use the flat or spoon side of the pusher. Keep cuticle moist while working. Avoid scratching the nail plate so that live tissue at the root of the nail will not be injured.



1. **Clean under free-edge** – use cotton-tipped orangewood stick, dip in soapy water and



clean under free edge from the center toward each side with gentle pressure.

1. **Cleanse nails** – Brush nails in soap bath with a downward movement to clean nails and fingers of both hands. Then dry hands and nails thoroughly.

Completion:

1. **Bevel nails** – Carefully re-examine the nails for defects. Use fine side of the emery board like a nail to give the nail a smooth beveled edge.



2. **Apply the base coat** – Apply the base coat polish, starting with the little finger working toward the thumb.



2. **Apply liquid polish** – Apply the base coat polish, starting with the little finger working toward the thumb.



3. **Remove excess polish** – Dip a cotton-tipped or arrange stick into the nail polish remover. Apply it carefully around the cuticle and nail edges to remove excess polish.



4. **Apply top or seal coat** – Apply the coat with a long strokes to the left hand and then to the right in the same manners as the base coat. Brush round and under tips of nails for added support and protection.



5. **Apply hand lotion** – After the top coat is completely dry, as an extra service apply hand lotion with light manipulation over the hands from wrists to fingertips.



Prepare for a Plain Pedicure

Pedicure Equipment

3. Low stool for cosmetologist or manicurist
4. Ottoman on which to rest patron's foot
5. Waterproof apron or an extra Turkish towel

- 6. Special toenail nippers
- 7. Antiseptic solutions
- 8. Cotton pledgets and foot powder
- 9. Paper towels

Preparations:

- 1. Arrange required equipment, implements, and materials.
- 2. Seat patron in facial chair, assist patron in removing shoes and hose.
- 3. Place her feet on a clean paper towel on foot rest.
- 4. Wash your hands.
- 5. Rub the feet with an antiseptic (alcohol) before starting the procedure for pedicure.

Procedure:

- 2. Remove old nail polish from the nails of both feet.
- 3. File nails of left foot with emery board. Smooth rough edges with fine side of emery board.
- 4. Place left foot with warm soapy water.
- 5. Shape nails of right foot.
- 6. Apply cuticle solvent to the cuticle and under the free edge of each toenail.
- 7. Place right foot in bath.
- 8. Push the cuticles to loosen them.
- 9. Start trimming the dead cuticles.
- 10. Brush the nails of the feet.
- 11. Wipe with towel to dry the feet.
- 12. Massage each toe with cuticle cream or oil.
- 13. Repeat same steps with the other foot.

C. Apply ways of maintaining facial care and differentiate the different kinds of facial make-up

FACIAL BEAUTY CARE TREATMENT AND MAKE-UP

Types of Make-Up

- 9. **Ordinary or day make –up** – This is basically simple and light make-up. It is appropriate in ordinary occasions, church or going to work. Choose the shade that is very light. The time of the day determines how much make-up is to be applied. Day make up is light and suits casual wear. Applied lightly, neatly, and beautiful it will go with any kind of clothes for day wear.
- 1. **Evening make-up or heavy make up** – It uses darker shades. Heavy application of make-up cannot give a glowing effect to the person. Color or shades of make up are carefully chosen to complement the color of the dress.
- 1. **Photographic make-up** – Screen make – up is applied to the customer who wants to appear beautiful in pictures. Those who look attractive or good looking in pictures but are not in person are photogenic. On the other hand, there are those who, due to poor lighting or incorrect make up application, appear unattractive in pictures.
- 2. **Stage screen/theatrical make up** – What is seen on the screen are cinematic effects. Stage make up can change the appearance of an individual's face through the use of varied cosmetics. Some of these cosmetics are plaster of paris, vaseline, zinc oxide and spirit gum among others.

Preparation

Usually, make up is given after a facial massage. However, if the make up is applied before a comb-out is given, remove rollers and clips and be sure to drape the patron’s head to protect her hair.

The patron is reclined in a facial chair with her head slightly raised. The cosmetologist may sit at the back of the patron to give the service or may move to the front of the patron for ease of application.

Implements and Supplies

Cleansing cream	Eyebrow pencil
Cotton pledgets	Mascara
Astringent lotion or Skin refreshener	Lipstick
Liquid foundation	Lip brush
Cream, liquid, or cake foundation	Eyebrow brush
Blush on	Loose powder
Eye shadow	Headband
Eyeliner	Towel
Tissues	Cotton

Procedure in Giving Make up

4. **Apply cleansing cream** – Remove a small quantity of cleansing cream from the bottle of cream and place all over the face of the patron, then rub over the face to remove the dirt or clean the face.
1. **Remove cleansing cream** – With a tissue, use an upward or outward motion.
2. **Eyebrow** – See to it that the eyebrow is in proper shape. If not, arching is given first before applying eyebrow pencil.
3. **Apply astringent lotion or skin toner** – For oily skin apply astringent lotion; for dry skin apply a skin toner. Moisten a cotton pad with lotion and pat it lightly over the entire face, under the chin and on the neck. Blot off excess moisture with tissues.
4. **Apply foundation** – Place the amount needed on the palm of the hand. Choose the kind of foundations and shades best suited and apply it evenly over the entire face and around the neckline with a gentle upward motion. Blend carefully near the hairline. Remove the excess foundation.
5. **Apply blush-on** – Liquid cream or cake cheek rouge is applied on cheek bones with a sanitized soft brush.
6. **Apply eye shadow** – Select shades to match eyes or to complement them. Apply lightly on the upper lids or gently outward with fingertips.
7. **Apply eyeliner** – Eyeliner can be used to make the eyes look large and lashes appear thicker. Choose the shade of eyeliner that harmonizes with the skin. Gently draw a very fine line along entire lid as close to the lashes as possible. If an eyebrow pencil is used, be sure the point is sharp so that the line will be only an illusion. Care should be taken to avoid injury to the patron.
1. **Use eyebrow pencil** – Brush the eyebrow in place with light feathery strokes. Sketch on brows with fine-pointed pencil. Cream, liquid or cake eyebrow coloring are available and applied with a brush.
2. **Apply powder** – Powder the entire face to minimize the shine of the skin and make the face even on the application of the foundation. Powdering the eyelids will prevent eye makeup from smearing. Remove excess powder.
3. **Apply mascara** – Apply cream mascara on the eyelids. Apply and brush upward on the underside of the upper lashes. Then gently tip the lower lashes.
4. **Apply lip rouge** – Lip rouge is removed from the container with sanitized spatula. Outline lips with the fine point of a lip brush. Ask the patron to close the lips in a relaxed position.
5. **Give finishing touches for a final retouch.**

Corrective Make-Up

Corrective facial make up helps to play up the good features and tone down the bad ones. Facial features can be accented with proper highlighting or subdued with the correct shadowing or shading and balanced with the proper style.

1. **Eyes too far apart** – When the distance of the eyes is more than the size of one eye.
Remedy:
 - a. Draw the eyebrows close together.
 - b. Apply darker shades of eye shadow at the inner corner of the eyes and fade out at the outer corner. This gives an illusion of closeness.
2. **Close-set eyes** – For eyes that are set too close together apply shadow lightly up from the outer edge of the eyes.
Remedy:
 - a. Draw the eyebrows wide apart.
 - b. Apply darker shades at the outer corner of the eyes and lighter shade towards the inner corner.
3. **Bulging eyes** can be minimized by blending the shadow carefully over the prominent part of the upper lid. Carrying it lightly to the line of the brow. These kinds of eyes are considered big or large because of prominently bulging eyelids. Use dark shadow as illustrated.
Remedy:
 - a. Extend eye make up upward.
 - b. No need for eyeliner.
 - c. Extend eyeliner at the eyelid.
 - d. Use dark shades of eye make up to hide the prominent eyelid.
 - e. Do not use frosted eye shadow or a highlighter to avoid emphasizing bulging eyelids.
 - f. Use only one dark shade of eye make up.
4. **Chinky or Chinita eye** – This kind of eye is small and can be made to appear larger by extending the shadow slightly above and below the eyes.
Remedy:
 - a. Use another shade of eye make up at the outer and inner corner of the eyes.
 - b. Use a highlighter at the center of the upper lid.
 - c. Use some eye make up on the lower lid. Apply along the lower eye lashes.
 - d. Curl the upper and lower lashes and kitcher them with mascara.

Corrective Make up for the Lips

3. Thin Lower

Lip Remedy:

- a. Extend curve of lower lip to balance.
- b. Use a lip brush to shape the lip.
- c. Choose a right shade to emphasize the correct shape of the lower lips..
- d. Draw a new shape of the lips.

4. Thin Upper Lip – Build up the curve of the upper lips to balance

Remedy:

- a. Extend curve of upper lips to balance.
- b. Use a lip brush to reshape the upper lips.
- c. Draw the new shape of the lips to reshape the upper lips.

5. Large Full Lips – Keep lipstick covering inside of lip line. Shade color off at side. Keep corners very sharp and clean-cut.

Remedy:

- a. Cover the lips with fountain.
- b. Use a dark shade of lipstick to subdue the fullness of the lips.
- c. Draw the new shape of the lips inside the original lip line.
- d. Fill the rest of the lip rouge.

1. Small mouth – Build outsides of upper and lower lips and extend the corner of the mouth.

Remedy:

- Draw the shape of the lips outside the original lip line.
- Fill the outside of the lips with lipstick.
- Draw the real or standard shape of the lips to get the right shape of the lips.

Eyebrow Arching

Importance of Eyebrow Arching

Eyebrow arching has a marked effect on the beauty and contour of the face.

The natural arch or growth of the eyebrow follows the bony structure or the curved line of the orbit (eye socket). The majority of persons have a disorderly growth of hairs both above and below the natural line. These hairs should be removed to give a clean-cut and attractive appearance.

Correct eyebrow arching gives a clean-cut expression and attractive appearance to the face. The eyebrows must however fit the shape of the face and the shape of the eyes. Shaping the eyebrows has thus become an art and a need.

Tools, Supplies, and Cosmetics Necessary for an Eyebrow Arch

- 1 Tweezers
- 2 Eyebrow pencil
- 3 Cleansing tissue
- 4 Eyebrow brush
- 5 Absorbent cotton
- 6 Antiseptic
- 7 Creams

Procedure for Giving an Eyebrow Arch

3. Prepare all the necessary materials needed.
4. Prepare the patron. Seat patron in an inclined position as for facial massage.
5. Select the type of arch.
6. Covers the patrons eyes with cotton pledgets moistened with which hazel or boric acid.
7. Brush eyebrows with a small brush to remove powder or scaliness.
8. Soften brows. Saturate two pledgets of cotton or towel with warm water and place over brows. Allow to remain on brows long enough to soften and relax eyebrow tissue sufficiently. Brows and surrounding skin may be softened by rubbing emollient cream into them.
9. Remove hair between brows.
Tweezing - In tweezing, stretch the skin that with index finger and thumb of the left hand. Grasp each hair individually with tweezers and pull with quick motions in the directions in which the hair grows.

Sponge tweezed area frequently with cotton moistened with an anti-septic lotion to avoid infection. Remoisten the cotton if necessary.

10. Remove hairs from above eyebrow line. Brush hairs downward. Shape the upper section of one eyebrow, then shape the other sponge area with anti-septic frequently.
11. Remove hair from under the eyebrow line. Brush hairs upward. Shape the lower section of one eyebrow, and then shape the other. Sponge the area with an antiseptic frequently.
12. Apply an astringent. After the tweezing has been completed sponge the brows and surrounding skin with an astringent to contract the area.
13. Apply brow make up. Brush brows, placing the hairs in their normal position. Use eyebrow pencil where necessary. The eyebrows should be treated about once a week.

1. Size – refers to the density of hair growth of the brows.

Thick – Some hair growth is superfluous.
Thin – Hair growth is sparse and strands are thin.
Medium thick – hair is neither too thick nor too thin.

2. **Shape** – refers to the form of arching of eyebrows.

- Normal
- Straight
- Rounded
- Oblique
- Angular



6. **Position** – refers to the placement of eyebrows.
High – high positioning of eyebrow increases the width of a narrow forehead.
Low – Low-placed eyebrows tend to narrow down the width of the forehead.
Far apart – Eyebrows that are far part tend to widen the eyes.
Close-set – Eyebrows that are too close to one another tend to make eyes appear close to each other.

Facial Treatments

Purpose of facial Treatment

- A Preventive** – This treatment is given to maintain the health of the facial skin by correct cleaning methods, increased circulation, relaxation of the nerves, and to activate the skin glands and metabolism, through massage.
- B Corrective** – To correct some facial skin condition as dryness.

Plain facial

Skin facial is a very restful service or treatment in the beauty salon. The customers are happy and contented in the stimulation from massage, the soothing effects of creams and lotions and the finished application of an attractive make-up. Facials can be given as often as once a week except where otherwise indicated.

Implements and Supplies

Cleaning cream	spatula
Astringent lotion	towel
Skin freshener	basin
Cleansing lotion	facial towel
Tissue	warm water
Absorbent cotton	muscle oil
Talcum powder	facial tray

Procedure for Plain Facial

1. Prepare all the materials needed.
2. Prepare the patron.
 - Place a clean towel across the back of the facial chair.
 - Ask patron to remove jewelry like earrings or other accessories.
 - Put a headband or fasten the hair to protect the patron's hair.
 - Adjust the head rest and then set the chair to a reclining position
 - Cover the eyes with wet cotton.
1. Analyze the skin
 - Cleanse the face to determine if the skin is dry or oily.
 - This analysis will determine:
 - The kind of skin toner
 - The color of make up to apply
 - The choice of cream to be used in massage
 - Remove cleansing cream
 - Wipe the face with tissue paper or a warm moist towel. Remove all the cream from one area before proceeding to the next.
 - Wipe the face again with warm moist towel or facial steamer.
2. Apply emollient cream
3. Perform the facial manipulation.
4. Apply astringent lotion.
5. Apply foundation and make up the face.
6. Completion.
 - Give finishing touches.
 - Assist the patron with her garments and accessories.
7. Clean up

Facial manipulation

Instructional Manual for Beauty Therapy

nipulation, it must be remembered that the tempo or rhythm induces relaxation.

1. Chin movement – Lift chin using a slight pressure.
2. Lower cheek movement – Circular movement from the chin to ear and rotate.
3. Mouth, nose, and cheek movement using circular movement.
4. Linear movement over forehead – Slide to temples, rotate slide to the left eyebrow, then stroke the hairline across forehead and back.

Circular movement over forehead.

1. Stroking movement – Slide fingers to center of forehead then slide fingers with slight pressure towards temples and rotate.
2. Eye movement – Press sides of eyes and rotate fingers around.
3. Nose and upper nose – Slide down nose using rotary movement.
4. Lip and chin – Draw fingers from center of upper lips and around mouth going under the lips and the chin.
5. Lifting movement – Proceed from the mouth to the top part of the ear.

Kinds of Facial Treatment

Treatment for whiteheads (milia) – this condition maybe treated under the supervision of dermatologists.

Treatment for acne – recommended for oily skin.

Packs and Masks – Recommended for normal skin.

Muscle Toning Treatment – Treatment for strapping movement.

D. Apply the basics in barbering, hair styling and hair treatment.

CARE FOR THE HAIR AND SCALP

Composition of Hair

Hair composed of a protein substance called KERATIN which is present in all horny growth such as nails, claws, and hoofs.

Chemical composition of hair are carbon, 50.65 %; hydrogen, 6.36 %; nitrogen, 17.14 %; sulfur, 5.0 %; and oxygen, 20.8%.

Hair is divided into two principal parts:

8. **Hair root** – is that portion of the hair structure found beneath the skin surface. This part of the hair is enclosed within the follicle.
9. **Hair shaft** – is that portion of the hair structure extending above the skin surface.

Color of Hair

The natural color of hair, its strength and texture, depend mainly on hereditary qualities of a physical nature. The color of hair being an inherited characteristic is one which is easy to observe and classify.

Hair Distribution

Hair is found all over the body except on the palms, soles, lips and eyelids.

Types of hair on the Body

- A. Long hair grow from the scalp, protects the scalp against the sun's ray and injury, give adornment to the head, and form pleasing frame for the face.
- B. Short hair such as the eyebrow and the eyelashes, adds beauty and line of color to the face. The eyelashes help protect the eyes from dust particles and light glare.
- C. Lanugo hair is the fine, soft downy hair of the cheek, forehead, and nearly all areas of the body. It helps in the efficient evaporation of perspiration.

Materials and Cosmetics in Giving Hot Oil Treatment

6. Hair brush
7. Shampoo
8. Towel
9. Scalp or tonic
10. Cream or oil for hot oil
11. Heating cups
12. Infrared lamp

Preparation:

- B. Assemble all materials and supplies
- C. Help patron with dress or blouse
- D. Prepare patron

Procedure in Giving Hot Oil Treatment:

1. Preparation of patron for scalp treatment

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hing help to stimulate the scalp but it will also help to remove dust and dirt from the hair and give it added luster and sheen.

1. Brush hair for about five minutes.
2. Apply scalp product.
3. Apply infrared lamp for about five minutes.
4. Give scalp manipulation for 10 to 20 minutes.
5. Shampoo the hair.
6. Towels dry the hair to remove excess moisture.

1. Apply suitable scalp lotion or tonic
2. Style the hair.
3. Clean up the work station.

Kinds of Hot Oil Treatment

2. Dandruff hot oil treatment Procedure:

Prepare patrons for scalp treatment.
Brush the hair for five minutes.
Apply a scalp preparation according to scalp condition.
Apply infrared lamp for about five minutes.

5. Give regular scalp manipulation using either the faradic or indirect high frequency.
1. Give regular scalp manipulation.
2. Shampoo with corrective shampoo lotion.
3. Dry the hair.
4. Style the hair.
5. Clean up the work station.

1. Dry scalp Oil Treatment Procedure

Prepare patron for normal scalp treatment.
Brush hair for about five minutes.
Apply the scalp preparation for this condition. If a vegetable oil is used, work it gently but thoroughly into the scalp.
Apply the scalp steamer 7 – 10 minutes, or wrap the head in warm steam towels for 7 – 10 minutes.
Shampoo the hair.
Dry the hair.
Apply moisturizing scalp cream sparingly with rotary frictional motion.
Style the hair.
Clean up the work station.

2. Oil Scalp Treatment

1. Prepare patron as for normal scalp treatment.
2. Brush hair for about five minutes. Do not irritate scalp with brush bristles.
3. Apply a medicated scalp lotion to scalp only.
4. Apply medicated scalp ointment.
5. Apply infra red lamp for about five minutes.
6. Give scalp manipulation.
7. Shampoo the hair.
8. Dry the hair.
9. Style the hair.

HAIR SETTING AND HAIR STYLING

Kinds of Hair Setting

A. Roller Setting – these are for lifted hairstyle and for styles that are to have a straight hair effect. Rollers come in a variety of length and sizes.



1. **Clip or Pin Curls** – these are good for curls and are used to set curl sections for necklines, bangs, and to finish off the style at the bottom.



der upward or forward. They are handy for children's hair and for smooth hairdos.

form

Materials and Equipment Used in Styling

Tools:

- 2. Hair brush
- 3. Styling brush
- 4. Teasing brush
- 5. Roller brush
- 6. Hair pins

Supplies

- 1 Spray net
- 2 Setting lotion and setting gel

Equipment

- 3. Hair dryer
- 4. Hair blower

Different Kinds of Hair Setting for Long and Short hair

8. Pin Curling

Technique

Procedure:

Wet the hair with water or setting lotions, comb smooth and form shaping. Curls are usually made, starting at the open end of the shaping.

9. Roller Setting Technique

Procedure:

The hair is moistened with water or setting lotions in the same manner as conventional curl. The hair is then sectioned according to the number of roller that must be used to achieve the hairstyle desired.

Hairstyling

Each type of face demands a hairstyle that is rightly proportional; balance of line, and correctly frames the face.

The essentials of an artistic hairstyle must, therefore, be based on the following characteristics:

- 9. Shape of the entire head
 - Front view
 - Profile (side view)
- 10. Characteristics in features
 - Perfect as well as imperfect features
 - Defects or blemishes
- 11. Body structure, posture and poise

Suggested Hairstyle:

- 1. Chignon – Here, the hair is drawn softly to back of the head, leaving the ear covered with a single deep smooth wave at the side. The length of hair is then handled like fabric, curled, and folded into a graceful crown shape.



- 10. Brush up – Hair is brushed at the end up all around and caught up in a band at the back of the crown. Curls are left free and arranged in soft ringlets. A round based hair in large rollers, and is pinned to the crown to a cluster style.



Petals – Here, the style is brushed up with petals on the top of the head or slightly on the side, shaped with petal style. Hair is looped to the base and ends with soft natural looking waves on the side.



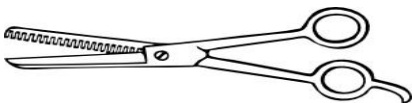
Haircutting

Materials, tools, and implements used for hair cutting

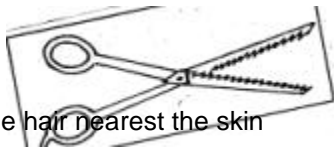
Hair shaping scissors – This scissors is especially used for cutting the hair shaping it the way the customers would want to. Notice the pointed shape of the scissor. This facilitates the cutting of hair around.



Thinning shears – One blade notched. This shear is for thinning thick, kinky hair. Unlike the hair shaping scissors, it does not have a pointed tip.



A. **Thinning shears**– This shear has both notches. It has the same function as the thinning shear with one blade notch



B. **Straight Razor** – use for removing fine hair nearest the skin



C. **Single-edge razor** – used for removing fine hair.



D. **Double-edge razor** - use for removing fine hair much easier because of the double edges.



E. **Comb** – a toothed strip of bone, metal, plastic, or hard rubber used for arranging the hair. The kinds of combs used in a beauty salon are the following:

a. All-purpose comb

b. Tail comb



c. Hair shaping

d. Large tooth comb

- 1 **Clipper** – this is an electric shaving device that is used to smoothen the neck after a neck trim. It can also be used with a comb to give a tapering effect to the cut at the back.. This is recommended for use with children to avoid accidents when cutting their hair. It is easy to use.



2. **Cape** – a piece of nylon or cotton material placed around the neck when cutting hair or giving facials. It is used as a protection for customers. This is to keep their clothes from being soiled from water, hair trimmings or chemicals.



- c. **Barber's brushes** – these are used to brush off trimming clinging to the cape or skin of the customer. They come in various shapes and sizes.
- d. **Water Sprayer** – this is used to wet the hair when cutting or trimming. The bottle is made of plastic or glass. It has a nozzle, hose, and regulator. It comes in various sizes, colors and shapes.
- e. **Do-all clip** – it is used to hold the sectioned hair when parting. It is about 3-5 inches long. It is made of plastic, metal, or a combination of the two. It is useful in hair shaping. It is sometimes called a duck pin.



Different Ways of Cutting and Shaping the Hair

- d. **Thinning with shear** – using the thinning shear, grip the hair by overlapping the middle finger a trifle over index finger.
Caution: In using the thinning shears it is advisable to avoid thinning the top layer of strand.
- e. **Slithering method** – hold a strand of hair straight out between the middle and index finger.
- f. **Razor cutting method** – hold the thumb groove part of the shank or fold the finger over the handle of the razor.
- g. **Shingling method** – start at the nape line shingling the hair upward in a graduated effect. After reaching the top of the section being shingled, trim the comb downward and comb the hair, proceed section by section until the entire back of the head is shingled in a smooth uniform manner.

How to Section the Hair for Different hands

- e. **Long hair**

Straight cut

Divide hair, leave strand for guide of length



Trim hair at the nape with a slight curve

1. Bring down strands. Cut hair longer to give allowance for stretching
2. Cut back section. Length should be similar to sides.
3. Do the same with other side.
4. Cut back similar to previously cut hair.
5. Check the length on all sides.

- b. Sides shorter than back



Part hair at the nape



Cut zig-zag style



- 1 Part hair at the side. Hold it between your middle and index finger. Slide gently then cut hair diagonally going around the back of the ears. Do the same from the nape going up to the crown.



2. Position the comb at right angle. Then cut hair diagonally going around the back of the ears. Do the same from the nape going up to the crown.



- A Snip the hair carefully at the ear.
- B Check the length and thickness. Adjust to balance.



b. Short hair

Tapered haircut

- a. Section the hair into three. Fasten with a do-all clip.
- d. Bring down the section on one side. Cut one strand. This is your cutting guide.



- e. Sliding the nape and going up at the right angle hold hair between index and middle fingers. Cut and comb.
- f. Hold next strands at acute angle then snip as in the first strand. Comb downward. The next strands are cut similarly. Do this up to the top or crown.
- g. Check cut hair on all sides. Check if thickness and length is balanced.





To thin the bangs, snip the hair into a W-shape.

1. Wedge Cut



1. Section the hair. Start at the nape. Snip hair about 2 inches into wedge shape.
2. Comb hair from up down. Cut in equal lengths.
3. Bring down strands of hair at the sides. Snip these to desired length.



1. Snip the fingers for a soft look.
2. From top, lift hair up and snip to desired length
3. Repeat the same procedure at the front. Snip in zigzag style
4. Check the hair on all sides to insure balance. Then blow-dry.



C. modern Style of Haircutting



- a. divide hair into two starting behind the ears.

2. Thin out the lower half using a razor, for about 5 inches.
3. Comb downward. Cut about 2 to 3 inches of the previously cut strands.



Comb the remaining hair in the same length as the cut ones.



4. Part the top section and starting at the side, cut with a razor. Then snip the ends straight. Always use the back as guide.



5. Repeat the same on the other side. Pick out about 5 strands of hair from the fringes longer than other parts and set to style.

