PC Concepts

1.   Common Input/Output (I/O), communication and processing devices.

INPUT (Data sent to the computer)	OUTPUT (Data displayed from the computer)	COMMUNICATION (Data being transmitted to other devices)	PROCESSING (Control storing and retrieving of data)
Keyboard	Monitor or TV	Computer modem	CPU
Mouse	Printers	Network Interface Cards (NIC)	Graphics Cards
Web Cam or Digital Camera	Speakers or Headphones	WIFI and access point	Computer Memory
Scanner	Projector	Bluetooth	Network Cards
Card reader		Smart phones	
Microphone			

2.   Technologies behind common peripheral devices
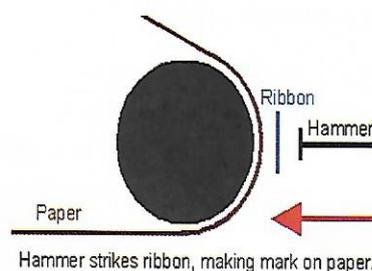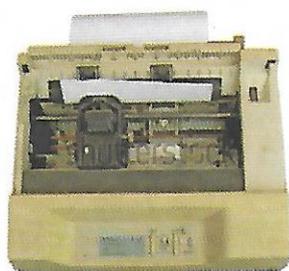
Printers

A printer is any device that prints text or pictures on paper. There are two (2) main types of printing technologies:
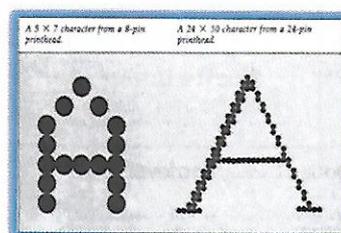
1. Impact printers
2. Non-impact printers

Impact printer technology

These printers operate by a mechanism where components come into direct contact with paper to create an image. Impact printers are the oldest printing technology still in use today. The three most common forms of impact printers are <u>dot-matrix</u>, <u>daisy-wheel</u>, and <u>line printers</u>.

Example: Dot matrix printers - uses a little hammer with multiple <u>small pins</u> to strike a ribbon coated with ink, allowing for ink transfer onto paper at the point of impact.


Ribbon
Hammer
Paper
Hammer strikes ribbon, making mark on paper.

Dot matrix printers use the hammer to print characters with a matrix of dots as shown below.

A 5 X 7 character from a 8-pin printhead.   A 24 X 30 character from a 24-pin printhead.

Non-impact printer technology

These printers do not operate by striking a head against a ribbon. Examples of non-impact printers include <u>laser</u> and <u>ink-jet</u> <u>printers</u>.
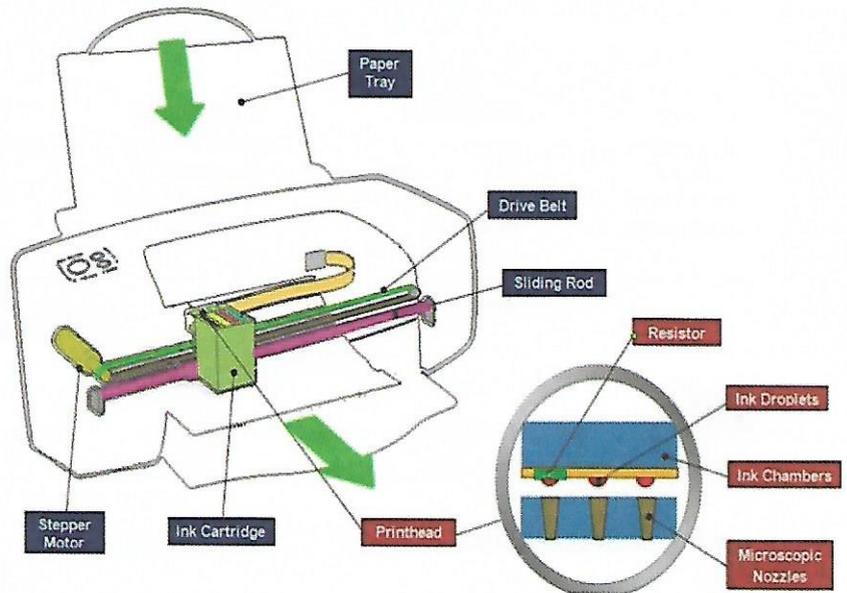
Ink-jet printing

Ink-jet printing works by spraying ionized ink onto a sheet of paper. Magnetized plates in the ink's path direct ink onto paper in the desired shapes. Ink-jet printers are capable of producing high quality print compararable to that produced by laser printers. A typical ink-jet printer provides a resolution of <u>300 dots per inch</u>, although some recent models can offer higher resolutions.
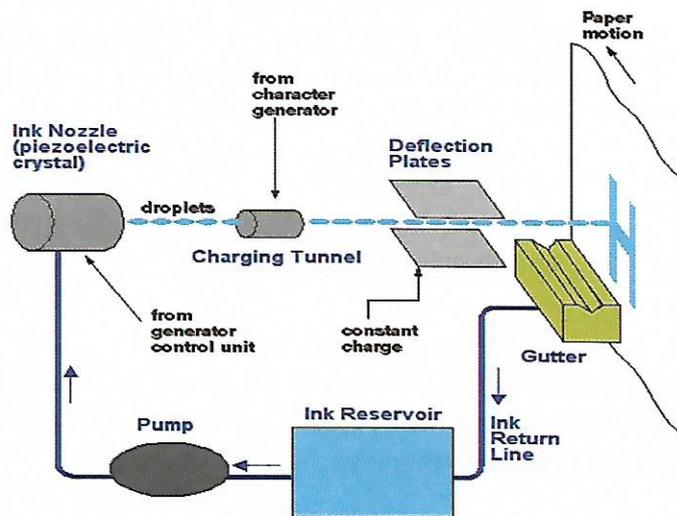
Laser printing

Laser printers are highly similar to photocopiers as both use a similar type of technology. When something is printed, the computer sends multiple streams of electronic data to the laser printer.
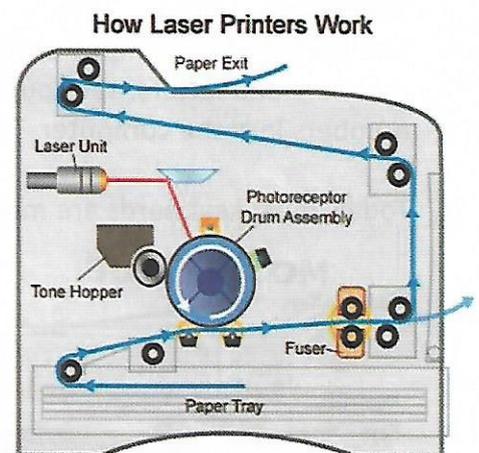
An electronic circuit in the printer processes this data which can include determining what the document should look like on the page. A laser is beamed back and forth across a drum inside the printer, building up a pattern of static electricity. The static electricity attracts a kind of powdered ink called <u>toner</u> onto the paper. Finally, as in a photocopier, a fuser unit bonds the toner to the paper.

The laser printing process:

1. Charging
The photosensitive drum surface is negatively charged with a static charge.

2. Exposure
Laser beams scan the photosensitive drum to form an image. Areas exposed to the laser beams lose their electrical charge.

3. Developing
Toner is brought in close proximity to the drum and affixes to non-charged areas.

4. Transfer
The photosensitive drum is brought into contact with the paper* and a positive charge is applied from behind, transferring the toner onto the paper.

5. Fixing
Heat and pressure are applied to fix the toner to the paper.

Printing Characteristics

Type of printing technology	Type of printers	Characteristics
Impact printers	Dot-matrix Daisy-wheel Line printers	- They are the most useful for printing multipart forms such as invoices or receipts that may require carbon copy. - Very low-cost printing. - Printing can be noisier than non-impact printers.
Non-impact printers	Ink Jet Laser	- They have much higher resolutions because instead of using metal pins they can use drops of ink or toner particles. - Can be expensive - Better Quality - Much quieter

Keyboards

The keyboard is an input device used to enter data. The keyboard layout consists of numbers and letters. Without the keyboard you cannot enter your name, address or numbers into the computer. The computer requires the keyboard to take in data.

Today, most keyboards are manufactured in the **QWERTY** format, as shown below.
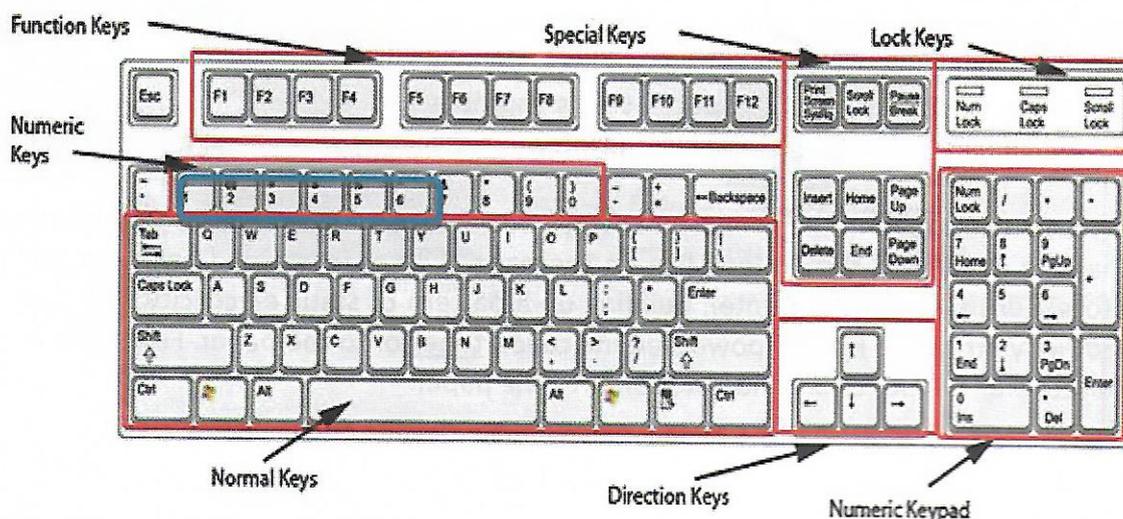
The different key types on a keyboard include:

Function Keys (F1.....F12):

These keys may have varying to no use at all. These uses depend on the operating system installed on the computer and the application software running.

For example: F1 – is usually used as the help key. In fact, almost every program opens a help screen when this key is pressed.

Alphanumeric

This is a combination of alphabetic and numeric characters. The alphabetic keys consist of the letters A to Z and are used to type text whereas the number keys are used to type numbers (0,1,2,3,4,5,6,7,8,9).

Space bar key:

The longest key on the keyboard is the space bar. It is used to insert spaces between characters.

Modifier keys:

These keys are only used in combination with another key. For example, on an IBM compatible PC, the Alt, Ctrl, and Shift keys are modifier keys. On the Apple Macintosh computer, the Control, Option, and Shift keys are modifier keys. The combination of the Modifier keys and other keyboard keys can be used to perform computer keyboard shortcuts.

Navigation keys:

These keys help users move around the different sections of a document or webpage, as well as in editing text. They include the arrow keys, Home, End, Page Up, Page Down, Delete, and Insert Keys.
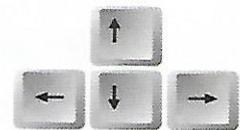
- Up arrow
- Down arrow
- Right arrow
- Left arrow

Control keys:

These keys are used alone or in combination with other keys to perform certain actions. The most frequently used control keys are Ctrl, Alt, Windows logo key (with the image of the Windows logo) and Esc.

How a keyboard works.

When a key is pressed, the bar pushes down through the hole to touch the contact layers below. Inside the hole is a small piece of rubber that stops the key moving down and pushes it back up when released, acting almost like a spring to the keys.

The pressed key applies pressure onto two conducting layers with lines of electrical connections connecting them together. This allows tiny electric currents to flow when the layers are pressed tightly against one another by a key being pressed down from above.

Shown on the diagram below is a close-up view of the underside of a single key. There is a single set of electrical connections on the lower sheet of plastic, printed in light grey. The other set is on the upper sheet of plastic (printed in dark grey). The two sheets are kept separate from each other by a clear plastic layer except at the holes, where the keys are pressed down to make the two sheets come into contact with each other.
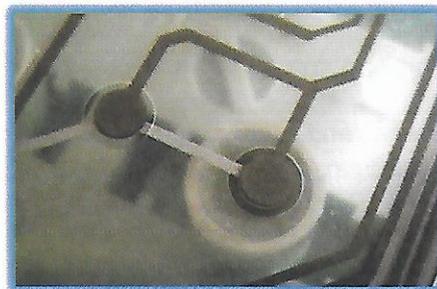
When you press a key, the top and bottom contact layers come into contact and the keyboard then sends a signal to your computer.
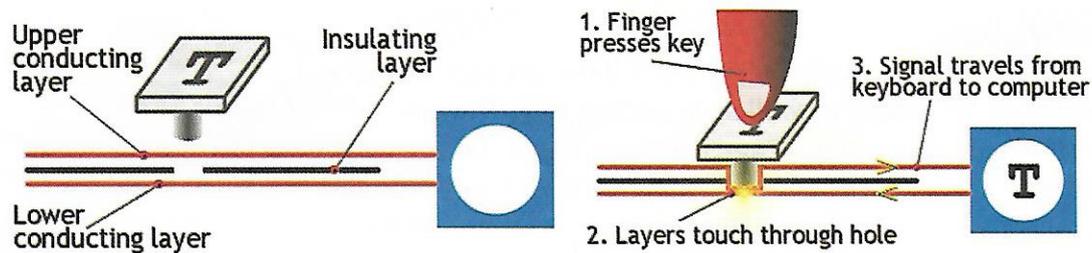
Mouse

The computer mouse is considered an input device. With a click of a button, the mouse sends information to the computer.

A mouse commonly has two buttons. At the top of the device you will find a left and right button that allows for "clicks". Some mice have a scrolling wheel in between the left and right buttons.

Different Types of Computer Mice

Mechanical mouse:


mecnanical mouse

A mechanical mouse is a computer mouse with a rubber ball inside that, when used, comes into contact with the table surface. This contact is what allows the mouse to serve its function. When the user moves the mouse around on a table's surface, the following things occur:

The ball rolls in response to the user's hand movements. This rolling is detected by two wheels that are perpendicular to each other. They are positioned in this way so that one wheel can detect up and down movements, while the other detects left and right movements. Together they detect mouse movements in any direction. A third wheel, the guide wheel is spring-loaded and presses the ball against the two sensor wheels.

Operating mechanical mouse.

   i. Moving the mouse turns the ball.
  ii. X and Y rollers grip the ball and transfer movement
 iii. Optical encoding disks include light holes.
  iv. Infrared LEDs shine through the disks.
   v. Sensors gather light pulses to convert to X and Y vectors.

You may need to clean the mouse ball regularly to clear dust particles.
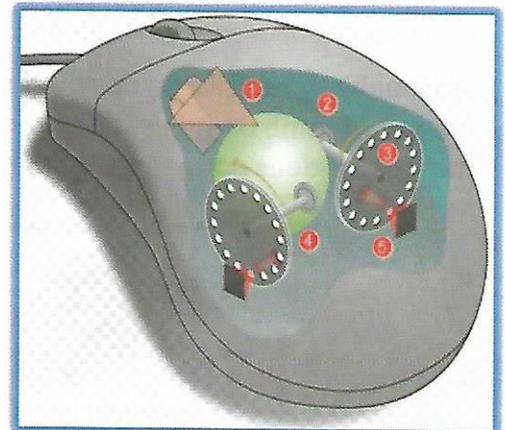
Optical mouse:

Uses a Light-Emitting Diode (LED) sensor to detect tabletop movement and then sends detected information to the computer. This information is then what moves the on-screen mouse pointer in the same direction as the mouse.
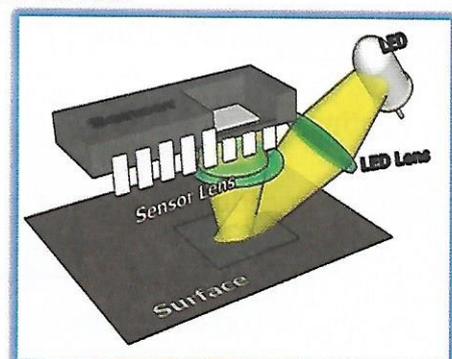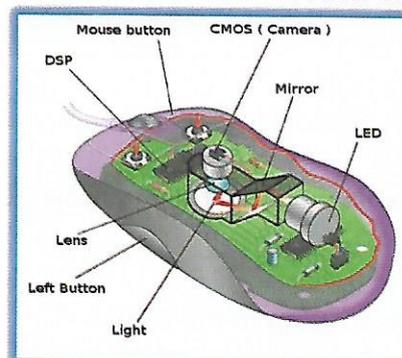
The optical mouse gets it power from the main computer system when it is plugged in. The powers up the many components inside the mouse (such as the LED lights and the camera or sensor).

The camera takes an image of the surface upon which the mouse is placed at a rate of 1500 frames/s and these images are then sent to the Digital Signal Processor (DSP). The DSP processes the images and creates the co-ordinates of the mouse (relative to its movements on the surface) and sends them back to the PC.

The mechanical mouse has a ball, whereas the optical mouse has a light emitting from the bottom.

An optical mouse does not need cleaning, because it has no moving parts.

Infrared (IR) or radio frequency cordless mouse: With both these types, the mouse relays a signal to a base station wired to the computer's mouse port. The cordless mouse uses batteries for power.

Trackball mouse: Like an upside-down mouse. Rather than roll the mouse around, you use your thumb or index finger to roll a ball on top of the mouse. The mouse does not move, so it does not need a lot of room, and its cord never gets tangled.


3.   **PC boots up process.**

What happens when you switch on a PC (IBM compatible PC)?

> The first thing a computer has to do when it is turned on is to *start the operating system*. The process of starting up the operating system is called booting.

Note: Booting a PC is also known as bootstrapping.

The start-up procedure or booting sequence of an IBM compatible PC is:

- Power button turned on.
- CPU processes instructions to jump to the BIOS.
- BIOS runs POST (Power-On Self-Test) and other necessary checks.
- BIOS jumps to MBR (Master Boot Record).
- MBR loads Operating System from storage device.
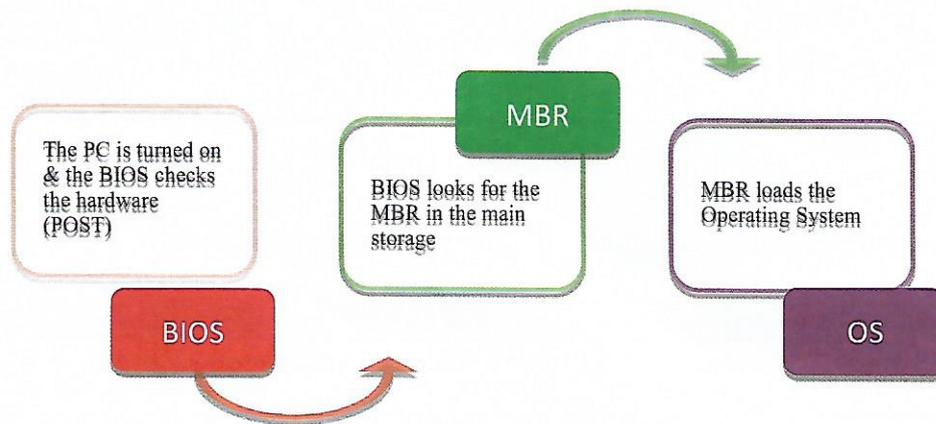
A PC knows how to boot because instructions for booting are built into one of its chips, the BIOS (or Basic Input/Output System) chip.

The BIOS chip loads POST (*Power on self-test*) instructions to check the hardware and then look in a fixed storage place which is usually the hard disk (the boot disk) for a special program called the *Master boot record* (MBR) or the boot loader.

The boot loader is pulled into memory and starts running. The boot loader's function is to start the real operating system.

Note: Operating systems can differ.

Common Boot up Problems

There are so many factors that can cause a boot up failure, both software and hardware related. Here are some common causes of boot up failure:

Problem	Possible Cause
No Power	Power cable not connected or Power Supply failure
Nothing on the screen	Monitor connectors or monitor failure
POST problem	BIOS settings problem or BIOS chip failure
POST Hardware check	Internal Component failure; Motherboard, CPU or RAM
Missing Operating System	OS not on the boot up drive or OS boot up files are missing
OS incomplete boot up	Corrupted boot up files or incomplete OS installation

1. Outline the technologies behind the following type of devices.

Type of device	Key technologies
Impact printers	
Non-impact printers	
PC keyboards	
Computer Mice	

2. Outline the PC boot-up sequence.

3. Outline some of the common problems faced by PCs when booting up.

Types of PC software

1.   Different types of PC software

Software is the computer program (instructions) that enables a computer to perform a specific task. Computer software is also termed "computer programs".

Computer software can be categorized into three (3) main types:

    i.   System Software
   ii.   Application Software
  iii.   Programming software

Computer software has to be installed into the computer's storage device (usually the hard drive). Once the software is installed, the computer is able to execute (run) the software. This involves passing instructions from the application software, through the system software to the computer hardware.

There are two (2) main classifications of software in terms of usage;

    i.   Common software or productive applications
   ii.   Specialised software

Productivity software is created to make work easier and more productive. If there is a task to be done, whether personal or professional, there are productivity apps that