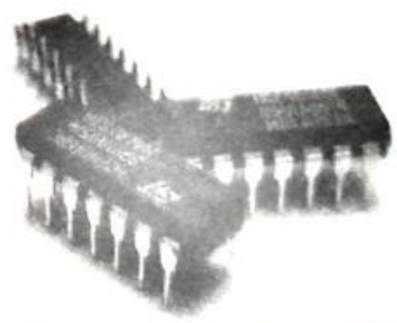
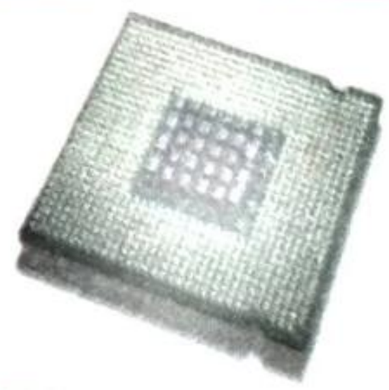
B8.1.1.1.1. Discuss the fifth generation of computers with emphasis on quantum computing.

The generation of computers is the changes in how computers are built over the years. The table below shows a summary of the different generations of computers and the main hardware that they use for processing.

No.	Time-period	Generations of Computer	Evolving Hardware	Picture of hardware
1	1940-1950	First-generation	Vacuum-Tube Based	
2	1950-1960	Second generation	Transistor-Based	
3	1960-1970	Third generation	Integrated-Circuit Based	
4	1970-Present	Fourth Generation	Microprocessor-Based	
5	Present-Future	Fifth Generation	Artificial Intelligence Based	

Let us discuss the fifth generation of computers in detail.

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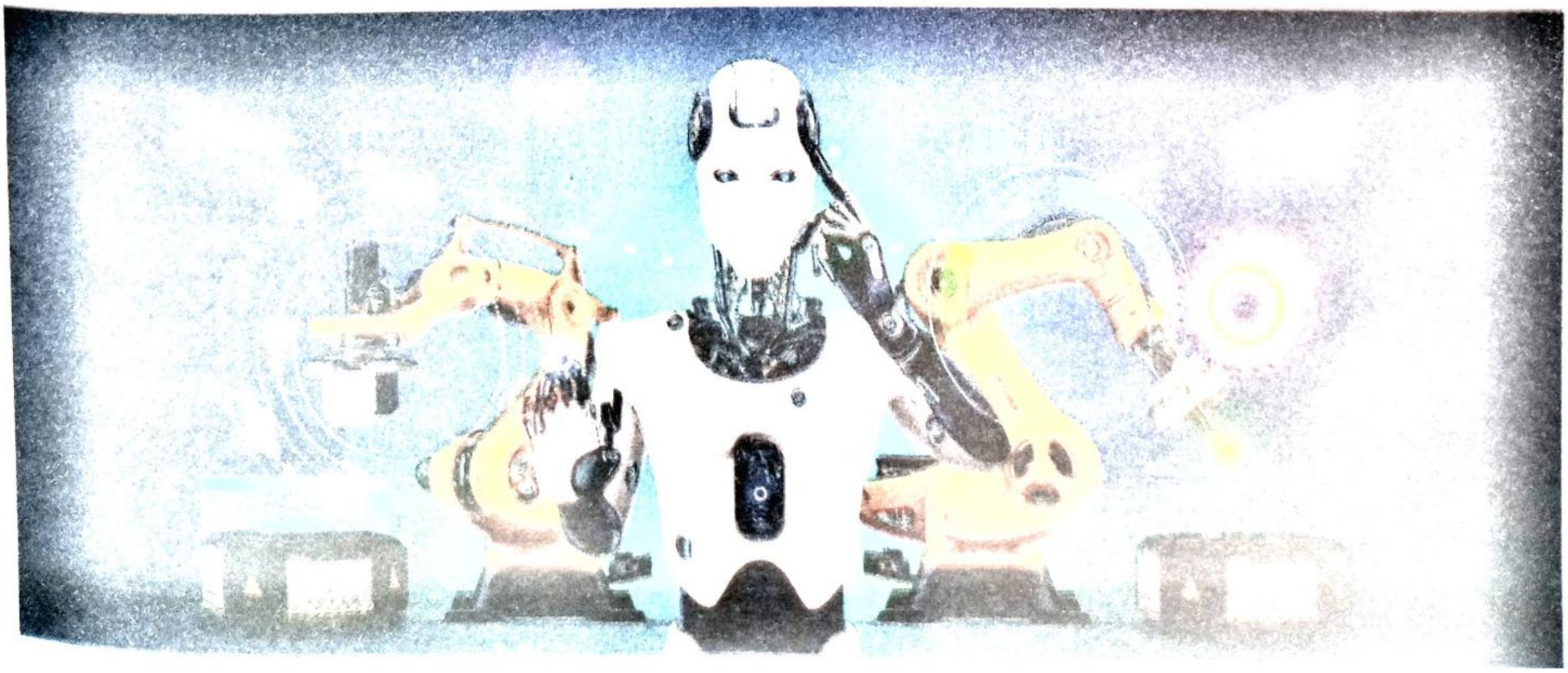
Fifth Generation of Computers

After the fourth-generation computers, which used Very Large Scale Integrated (VLSI) Circuit or microprocessors, the Fifth-generation computers were introduced. Fifth-generation computers, also known as modern computers, are still in the development stage and are based on artificial intelligence. In 1982, Japan invented the Fifth Generation Computer System (FGCS). Computers of this generation are based on microelectronic technology with high computing power and parallel processing. In the fifth generation, Very ArtLarge-Scale Integration (VLSI) technology became Ultra Large-Scale Integration (ULSI) technology, resulting in the production of microprocessor chips having over ten million electronic components. This is the most recent and technologically-advanced computer generation. Modern high-level languages, such as Python, R, C#, Java, and others, are used as input methods.

Artificial intelligence (AI) is a popular discipline of computer science that examines the meaning and methods for programming computers to behave like humans. The main application of AI is robotics, machine-learning and deep learning.



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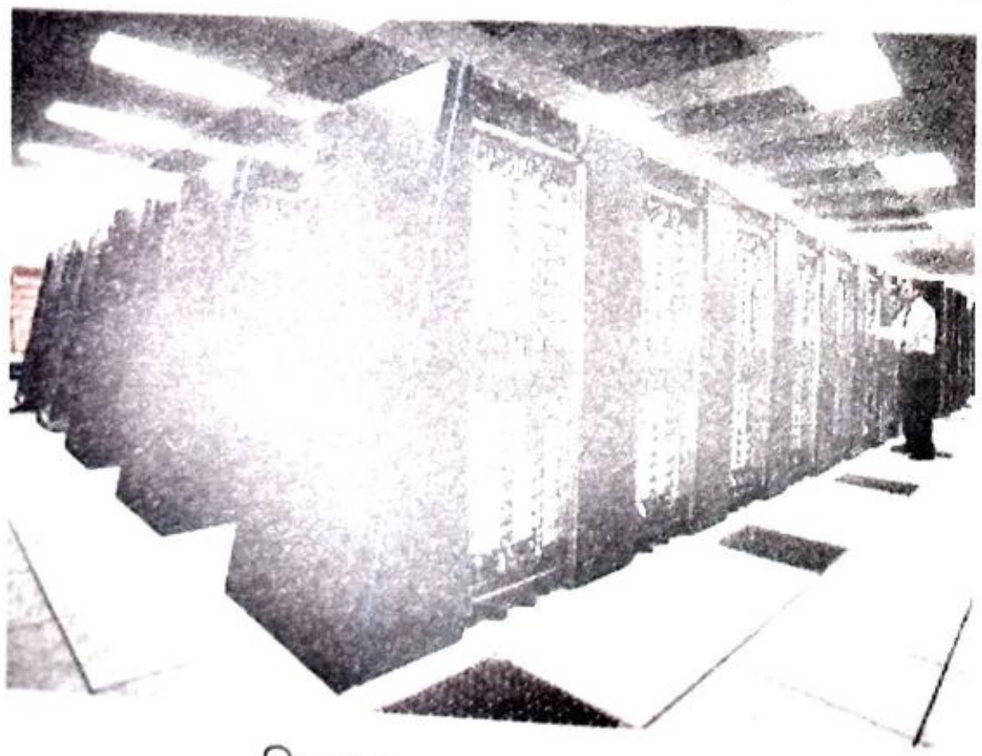
The primary goal of the fifth generation is to create machines that can learn and organize themselves. Artificial intelligence and parallel processing hardware are at the heart of this generation of computers. Artificial intelligence includes Robotics, Neural Networks, and expert systems for decision-making in real-life and natural language understanding. Even though they are still in development, computers in the fifth generation are more powerful, functional, and speedy. These machines were able to interpret human language as well as recognize graphs and photos, thanks to AI technology. Fifth-generation computers are being developed to address extremely difficult tasks, such as working with natural language. They will, hopefully, be able to utilize more than one CPU and will be less expensive than the current generation. Quantum computation will radically change the face of computers in years to come. Examples of fifth-generation computers include modern computers, such as Personal Computers (PC) Workstations, Laptops, Chrome Book, UltraBook, Supercomputers, Notebooks, Smart Watches, Smart Phones and Servers.



Supercomputer

Modern fifth-generation computers.

Features of Fifth-generation Computers

Following are some features of fifth-generation computers:

- The ULSI (ultra-large-scale integration) technology is used in this generation of computers.
- Natural language processing is now in its fifth phase of development.
- In this generation's computers, artificial intelligence has progressed.
- Parallel processing has advanced on these computers.

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- The fifth-generation computer includes more user-friendly interfaces and multimedia functions.
- These PCs can be purchased for a lower price.
- They are more portable and powerful.
- They are dependable and less expensive.
- It's easier to manufacture in a commercial setting.
- Desktop computers are straightforward to operate.
- Mainframe computers are extremely efficient.

Advantages of the Fifth-Generation Computer

The following are some advantages of fifth-generation computers:

- These computers are far quicker than those of previous generations.
- These computers are simpler to repair.
- These computers are substantially smaller in size than other generation computers.
- They are lightweight and easy to move.
- True artificial intelligence is being developed.
- Parallel Processing has progressed.
- Superconductor technology has progressed.

Disadvantages of the Fifth-Generation Computer

- They are sophisticated and complex tools to use.
- Excessive use of the Fifth-Generation of computers can make humans over-dependent on them.
- They can spy easily.
- Overuse can have a bad impact on health.
- They are extensively used in the manufacturing industries; therefore, the fear of losing jobs is always on the cards.
- Their waste can negatively affect the environment.
- It has been observed that data and information violations can happen when used improperly.
- Crashed Networks
- These computers are fast, and therefore rumours can spread quickly with a fast internet connection

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Advantages of parallel computing

- Saves time, allowing the execution of the application in a shorter time.
- Solves large problems in a short time.
- Can do many things simultaneously, by using multiple computing resources.
- It has massive data storage and quick data computation.

Disadvantages of parallel computing

- High power consumption by multiple computers
- It require expensive cooling techniques.
- It is hard to implement.
- It requires different models and programming.

Artificial intelligence software

Artificial Intelligence software is software that is designed to think intelligently like the human mind. This software learns patterns in data and uses them to make intelligent decisions on a given data. AI software features include: Machine Learning, Speech & Voice Recognition, Virtual Assistants, and Business Intelligence platforms. The following are some examples of AI software

Type of AI software

There are four types of AI software:

- **Artificial Intelligence Platforms:** This will provide the platform for developing an application from scratch. Many built-in algorithms are provided in this. Drag and drop facility makes it easy to use.
- **Chatbots:** This software will give the effect that a human or person is doing in a conversation.
- **Deep Learning Software:** It includes speech recognition, image recognition, etc.

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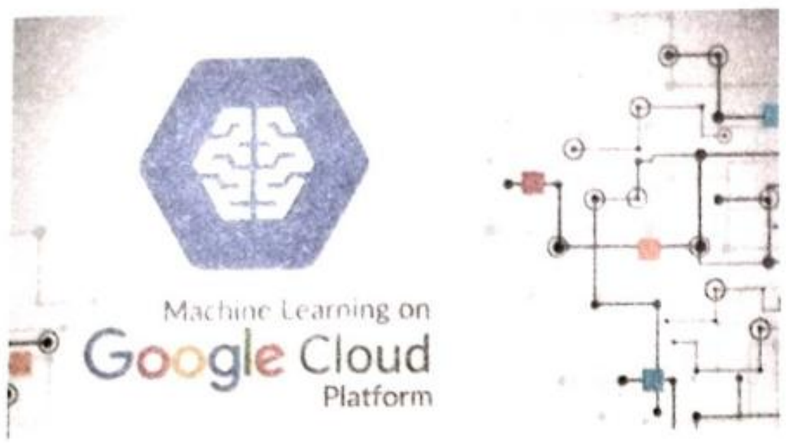
- **Machine-Learning Software:** Machine learning is the technique which will make the computer learn through data.

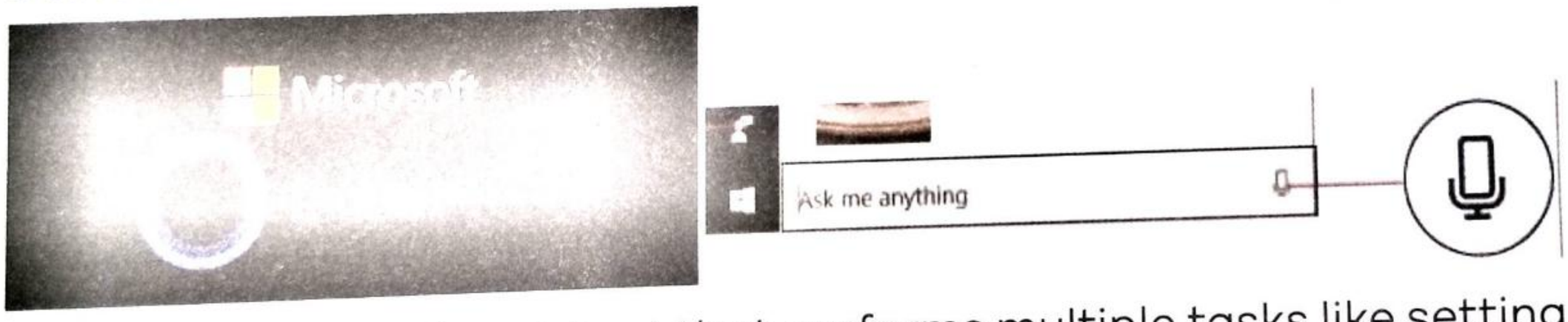
Examples of AI software

- **Google Cloud Machine Learning Engine**



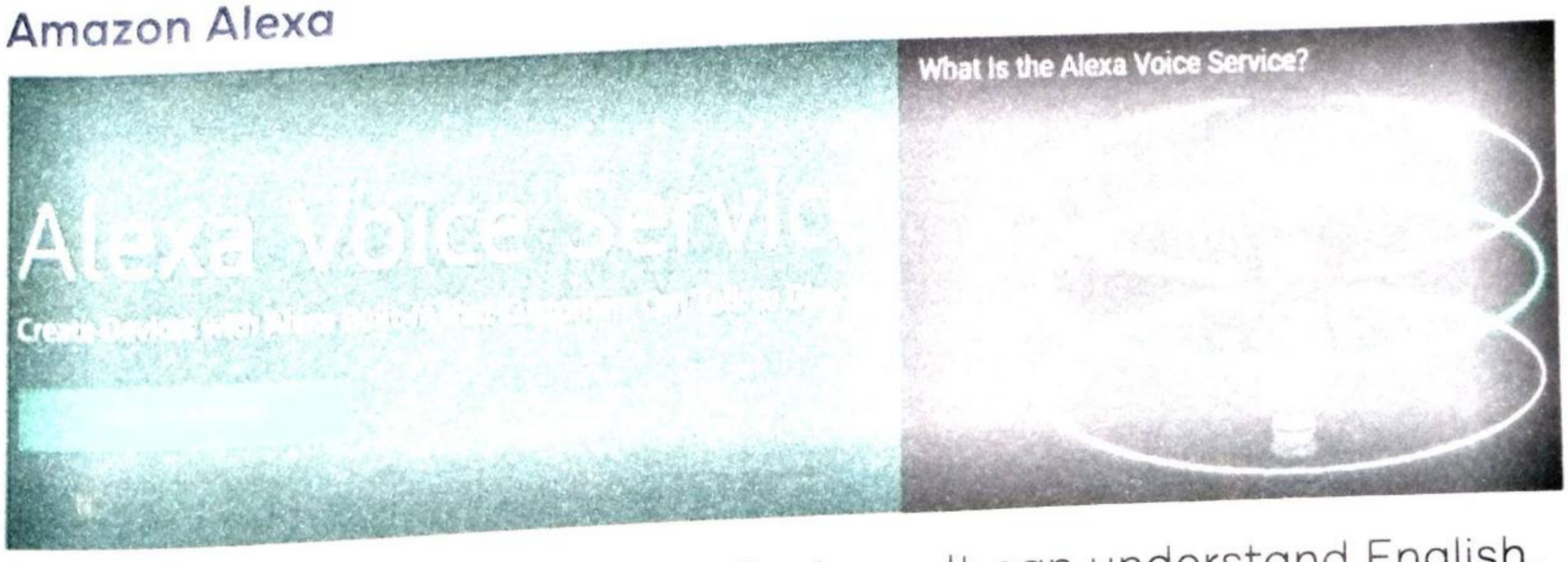
Google Cloud Machine Learning Engine is used to create and train machine learning software.

- **Cortana**



Cortana is a virtual assistant that performs multiple tasks like setting reminders and answering questions. It can listen and understand spoken language. It also has an integrated voice recognition system. It can be installed on Windows, iOS, Android, and Xbox OS.

- **Amazon Alexa**



It is also a virtual assistant like Cortana. It can understand English, French, German, Japanese, Italian, and Spanish.

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- **IBM Watson**

IBM Watson is a question-answering system. It provides support for Linux Enterprise Server 11 operating system.

Group Work

In groups of five (5) (depending on class population), each group should discuss the features of fifth-generation computers, quantum computing, parallel processing and artificial intelligence software.

B8.1.1.1.2. Demonstrate understanding of direct data entry devices (Graphic Tablet, Magnetic Card Reader, Optical Card Reader, QR code reader, Radio Frequency Identification (RFID) Readers)

Data entry devices are devices that feed machine-readable data directly into the computer without the use of a keyboard or mouse. Data entry devices include Graphic tablets, Magnetic Card readers, Optical Card readers, QR code readers, and Radio Frequency Identification (RFID) Readers. Data entry devices do not require data to be typed in, keyed in or pointed to a particular location on the computer. They capture data directly into the computer.

Graphic Tablet

A graphic tablet is used with a stylus to produce freehand drawings. The images produced can then be stored in a file on a computer.

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Uses

- It is used to produce drawings, computer graphics and digital designs.
- It is used in computer-aided design (CAD) work.
- It is used for fast input of complex characters, such as Japanese or Chinese characters.

Advantages

- It is possible to modify drawings before they are input.
- They offer a very accurate method of drawing (better than using a mouse or trackerball).
- They can record levels of pressure, unlike other point-and-click devices.

Disadvantages

- They are more expensive than other pointing devices (such as a mouse).
- It takes longer to produce a drawing, using this equipment than doing it with pen and paper.
- Menus are often not very user-friendly.
- Larger drawings (such as A4) are expensive to produce.
- The touch screens are damaged easily.

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Critical thinking

You have painted a nice picture, using your computer. Discuss how you can use a QR code to share your work with your friends.

Group Work

In groups of five (5) (depending on class population), each group should discuss the uses of data entry devices such as Graphic Tablets, Magnetic Card readers, Optical Card readers, QR code readers and Radio Frequency Identification (RFID) Readers.

B8.1.1.1.3. Examine the uses of the output devices: Braille printers, Impact, Inkjet, Thermal, Wax, 3D printers

An output device is any hardware equipment to display, project, or physically reproduce the results of data processed by a computer. Output devices send data from a computer to another device or user. Output devices provide data in different forms, such as audio, video, graphics, text, and hard-copy media. These devices are usually used for display, projection, or physical reproduction. Examples of output devices include Monitors, printers and speakers. Let us discuss more examples of printers as output devices.

Printers

A printer is an output device that generates hard copies of electronic data stored on a computer or other device. The following are some examples of printers.

Inkjet Printers

An inkjet printer produces hard copies by spraying ink onto paper. It contains a paper feed assembly, ink cartridge, print head, stabilizer bar, and belt. It stores the ink in cartridges and uses a separate cartridge to print several types of colour documents. These colours

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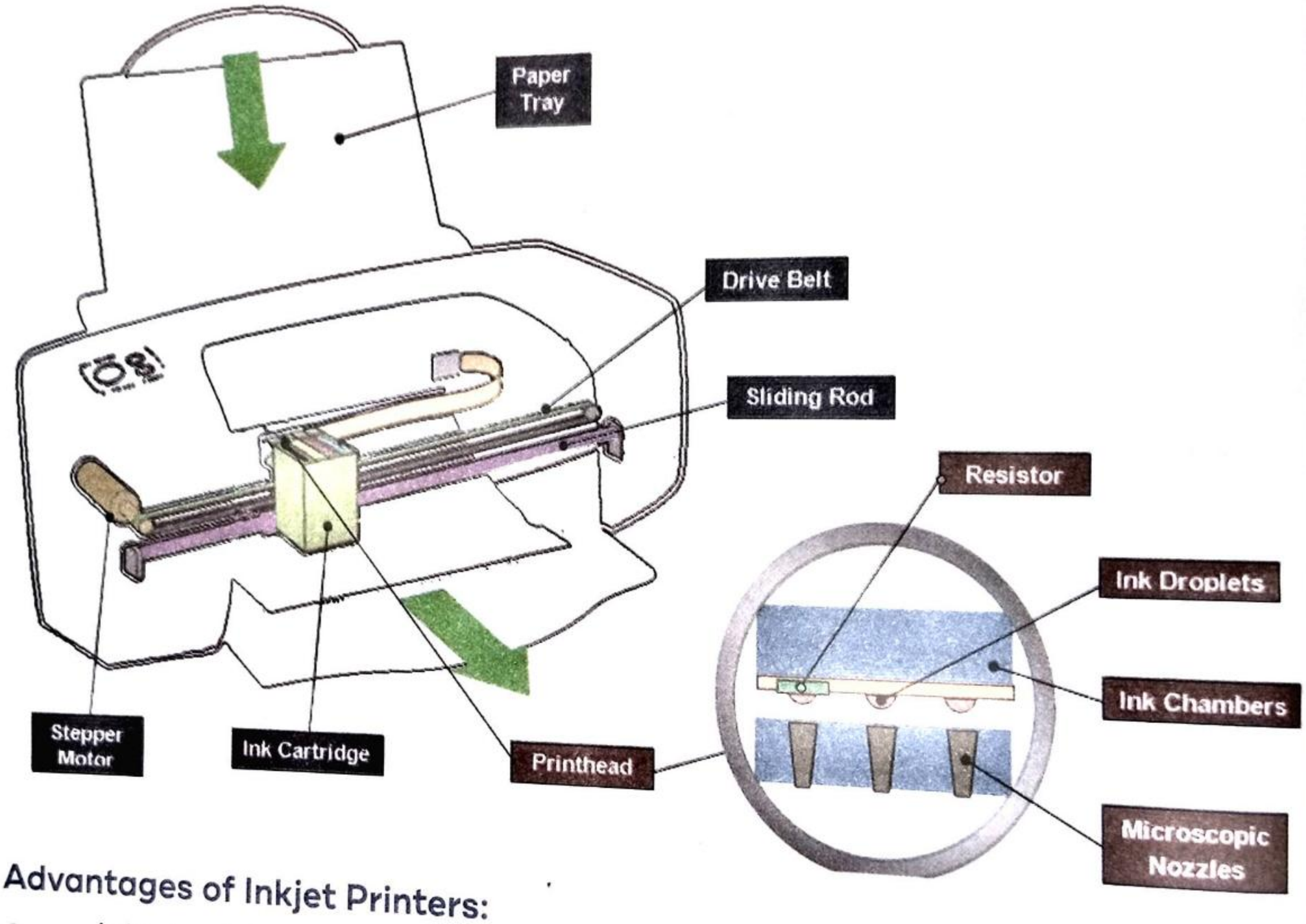
are a combination of cyan, magenta, yellow, and black colour. These types of printers can create high-quality pictures with the help of vivid colours. Furthermore, inkjet printers are more affordable and easier to use as compared to other printers.



Advantages of Inkjet Printers:

- Inkjet printers can produce high-quality output.
- These printers are reasonably fast and easy to use.
- Additionally, these types of printers do not take warm-up time.

Disadvantages of Inkjet Printers:

- They may take more time to print.
- Running cost is high.
- They do not allow the highlighter marker.
- Sometimes, they can produce a wrong warning of an empty cartridge.

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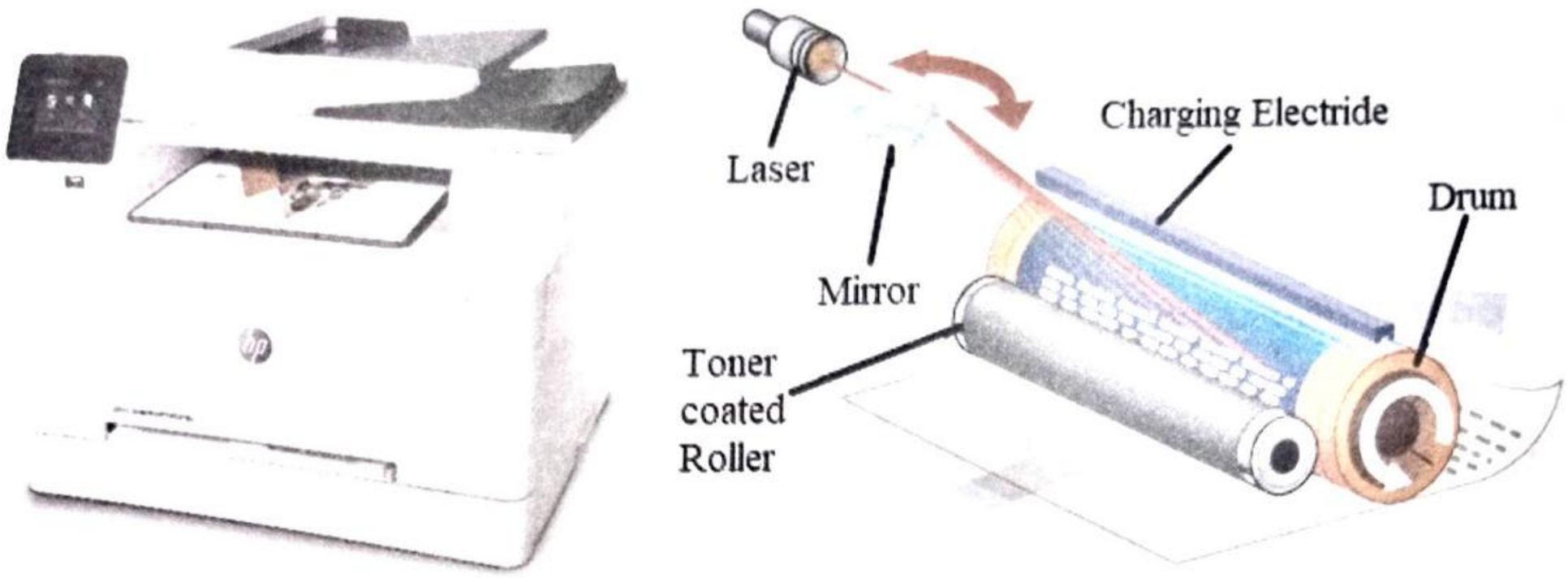
Laser printers



A laser printer uses a non-impact photocopier technology to text and images on paper. This means that no keys are striking the paper. The laser printer is one of the common personal computer printers. Whenever it gets input to print any document, a laser beam draws the document on a coated drum with the help of electric charges. When the drum is charged, it is rolled in toner (dry ink powder). The ink follows the image, which has charged on the drum. The ink is combined with the paper, including heat and pressure to create the hard copy. When the document is printed, the excess toner is collected, and an electric charge is removed from the drum. Most laser printers are capable of printing only in monochrome. The monochrome laser printer is around ten times cheaper than a colour laser printer.

Differences between a laser printer and an inkjet printer

There are many differences between a laser printer and an inkjet printer, such as:

- The laser printer contains dry ink, while an inkjet contains wet ink.
- An inkjet printer is approximately ten times more expensive than a laser printer as it requires replacing the ink very frequently.
- If the paper is wet, the inkjet printer will print the document with blur, but the laser printer will print clearly. The inkjet printer is suitable for printing fewer documents, while the laser printer can print more documents.

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Advantages of a laser printer:

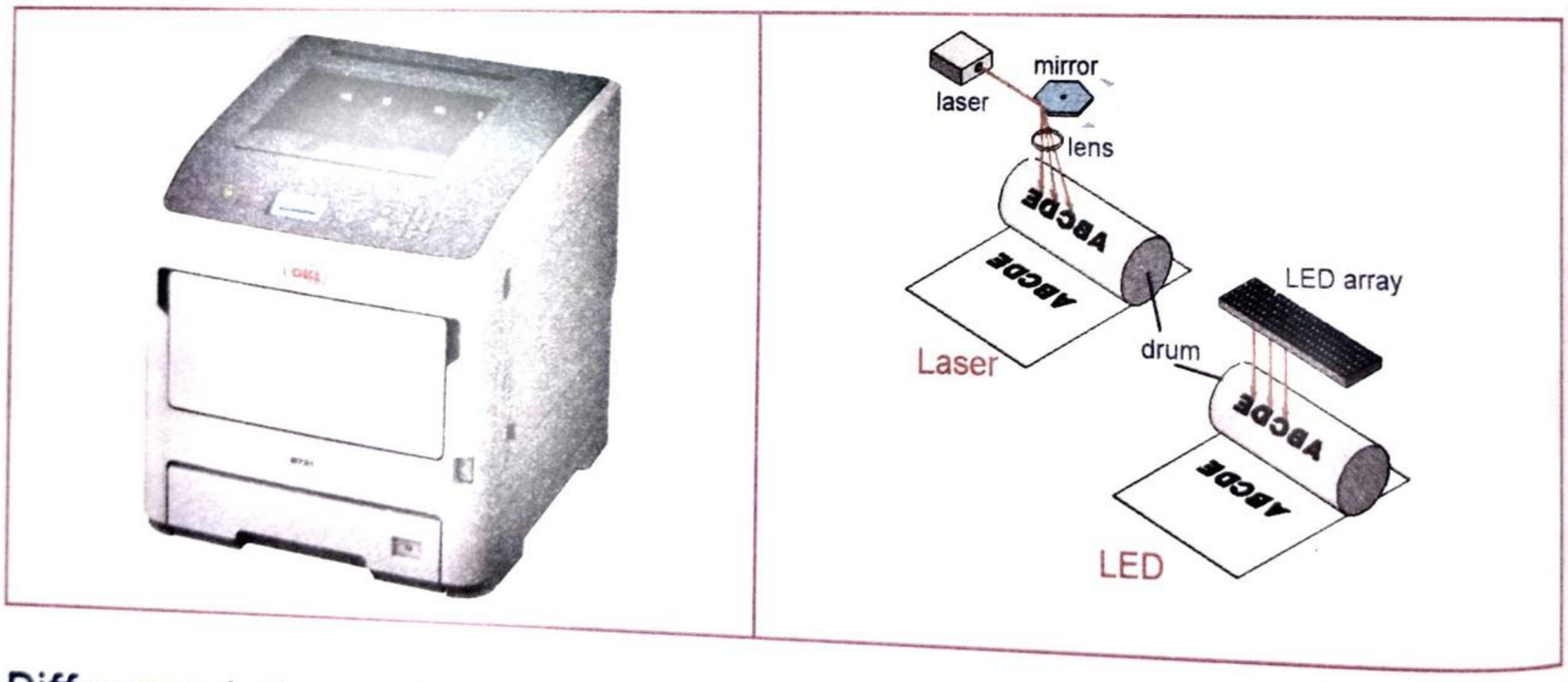
- This type of printer has a higher paper capacity.
- It is less expensive than the inkjet printer.
- It can print documents speedily.
- Furthermore, it can increase productivity.

Disadvantages of a Laser printer:

- Laser printers may need warm-up time.
- Laser printers are bulky as they required laser technology and an imaging drum.
- They require high voltage, which leads to small carbon emissions.

LED Printers

The LED printer is mostly like a laser printer. It uses the drum, ink, and fuser system to print black or coloured documents. This type of printer is non-impact; instead of using a laser in the printhead, they use a light-emitting diode (LED).



Difference between Laser printer and LED printer

There is a difference between a laser printer and a LED printers. LED printers use a strip of LEDs to create charges on the printing drum while laser printers use a laser and mirror. Although LED printers are not more popular as compared to inkjet and laser printers, they are gently gaining

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popularity.

Advantages of the LED printer:

- The manufacturing of LED printers is cheaper than laser printers.
- These types of printers mostly contain free warranty extensions.
- These printers are capable of printing on thick 3D items.

Solid Ink Printers

A laser-class solid ink printer is designed to save space and money on packaging. It uses a unique type of ink technology that is melted into a liquid before being used. Inkjet printers stream the ink directly on the paper, solid ink printers are different as they stream the ink on the drum. Firstly, transferring the ink to the drum than to the printer is a better way to get a good colour combination as a drum can be controlled more appropriately than the moving paper. Xerox acquired the colour printer division of Tektronix, Inc., in 2000. The solid ink printer was introduced in the market by Tektronix, Inc., with its crayonlike cartridges.

Advantages of a solid ink printer:

- The print quality of a solid ink printer is good as it produces dynamic colours and extraordinary print quality on a broad range of media, like envelopes, recycled paper, transparencies, and cardstock.
- Solid ink printers are easy to handle because they are made with non-toxic vegetable oils and do not melt in our hands. Unlike laser or inkjet printers, they do not spill or leak.
- This type of printer is capable of printing documents fast. Generally, it can print up to 30 pages per minute.
- The ink loading in the solid printer is easy as it includes sticks in particular shapes that only go to the correct slot. This type of printer contains the ink slot on the top of the printer, and it allows you to replace the ink at any time, including at the time of printing.
- A solid ink printer is designed in that way; they comprise only three main assemblies: print drum, print head, and controller. It takes less space as compared to the colour laser printer.
- Furthermore, this printer and its parts are more affordable than colour toner cartridges and colour laser printers.

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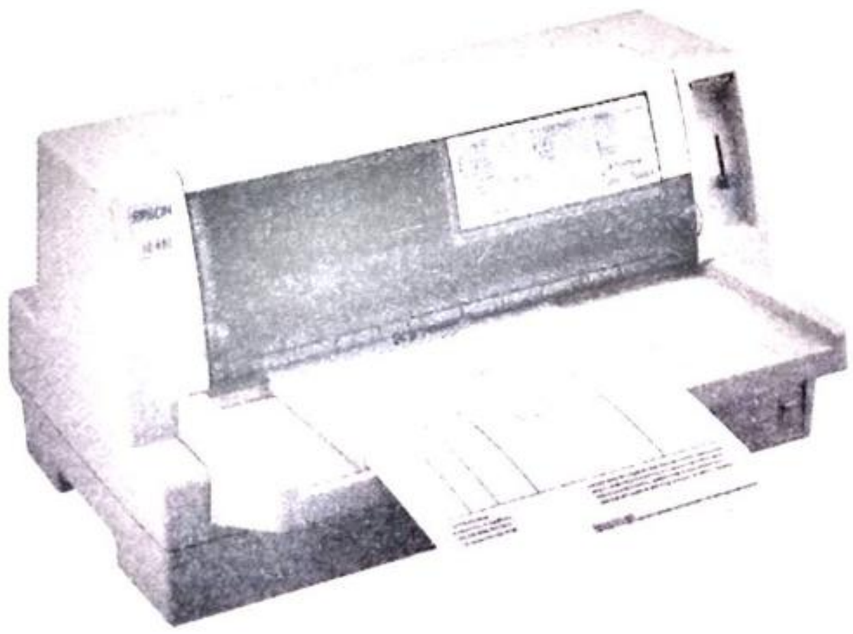
Disadvantages of a solid ink printers:

- These printers may require warm-up and cool downtime.
- These are sensitive to UV light, and colour may fade under the sunlight with time.
- These printers consume more power than laser printers.
- These printers are mainly used for printing large quantities. If it they are turned off in the middle of the printing theyit will take some time to warm up again.

Dot Matrix Printers

Dot matrix printer is also known as a pin printer, released by IBM in 1957. A dot matrix printer is an impact printer that strikes an ink ribbon using print heads to place thousands of little dots to form images and text. Nowadays, as compared to laser and inkjet printers, it is less used as its printing speed is slow and it generates lower quality images. However, dot matrix printers are still in use in some sectors like backs, package delivery companies and auto part stores.



Advantages of Dot matrix printer:

- Dot matrix printer is less expensive compared to most printers, and it is easily available on the market.
- It can print carbon copies of a particular print out, unlike non-impact printers.
- Its printing cost is lower than the other printers.
- Furthermore, its maintenance cost is less expensive than the other printers.

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Disadvantages of Dot matrix printer:

- The speed of the dot matrix printer is slow as compared to non-impact printers, and its output is also not of high resolution.
- It creates high noise when the pins hit the ribbon to the paper.
- It may be a time-consuming printer as it requires a single paper to wound up and aligned manually.

Multifunction Printers

A Multifunction printer is a hardware device that can perform various tasks, such as printing, scanning, faxing, and copying. It is also called the All-in-One printer. It is suitable for budget-minded businesses that want to reduce costs, consolidate assets, and improve workflow. Although it is necessary to connect the printer to a compute, with the help of a wire or wireless connection, sometimes it can be controlled from its control panel like a standalone copier. Furthermore, there is no need for more than one unit as it can easily complete multiple tasks within an office or home simultaneously.

Advantages of Multifunction Printers:

- Multifunction printers can save initial cost. Instead of purchasing many printers and fax machines, you can purchase only one large MFG for multipurpose.
- These types of printers are beneficial for homes and offices as they save a lot of floor space. It may be difficult to find space for the

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fax machine, printer, and scanner, but multifunction printers take limited space and can perform multi-task such as printing, faxing, and scanning.

- One of the best advantages of a multifunction printer is that operation functionality is faster as compared to laser printers or other printers. Also, some multi-function printers can send print documents, faxes, scan images, and copy all at the same time.
- Furthermore, printers need only one cable to power the whole setup, which reduces the congestion and electricity required to run the device. Thus, multifunction printers consume less power as compared to other printers.

Disadvantages of Multifunction Printers:

- The operating cost of a multifunction printer is high. Its maintenance cost is also expensive as it uses ink speedily as compared to other printers. All functions, such as faxing, copying, and printer, use ink faster.
- These printers perform a task based on the first in first out rule. So, all tasks stack up in a queue that can slow the machine. Thus, some people may have to wait to use the machine.
- When a multifunction printer is out of service or is broken down, scanning, printing, copying, and faxing will be completely stopped. It can be an issue for an organization if they have more requirements for faxing, copying, and printing documents.

Thermal printer

The thermal printer was invented by Jack Kilby. It is also known as an electrothermal printer, thermal transfer printer, or thermal wax-transfer printer. It utilizes heated pins to produce the image on paper. This type of printer is widely used in banking, airline, grocery, entertainment, retail, healthcare industries, fax, and calculator machines. This printer is low-cost and prints fast, and does not use ink like other printers. It primarily depends on thermal paper to produce images.

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This technology is useful for an organization as it is reliable as well as cost-effective. Employees can work continuously without getting interrupted because they do not need to change the cartridges or ribbons in this printer.

Advantages of Thermal printer:

- One of the main advantages of a thermal printer is that it does not need any ribbons or cartridges. Thus, companies can save time by using it.
- This type of printer is easy to use as it has fewer buttons, including the use of the software.
- It is beneficial for offices as it provides noise-free environments.
- This type of printer is cheaper and available in several models and sizes.
- These printers are faster and more efficient in printing monochromic ones than other printers.

Disadvantages of a Thermal printers:

- Generally, a thermal printer does not produce colours that print out well, like standard printers.
- At the time of printing, the high heat can be harmful to the printhead. Consequently, if the printhead breaks down, you have to pay for a repair or buy a new one.

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Plotter

A plotter is a hardware device or a printer, which was first invented by Remington-Rand in 1953. It is developed to print vector graphics and uses a pencil, pen, marker, or other writing tools for drawing continuous lines instead of using ink or tonner. It is widely used to print a hard copy of schematics and other similar applications.

There are several types of plotters given in the below list:

1. **Drum Plotter:** It is also known as roller plotter. It turns the paperback and forth on a drum while pens move left and right. With the help of combining these two directions, the line can be drawn in any direction.
2. **Flatbed Plotter:** In a flatbed plotter, a piece of paper is placed on a large horizontal surface. A travelling bar moves across the surface and draws the lines.
3. **Electrostatic Plotter:** It draws on paper that is charged negatively with positively charged ink or tonner.
4. **Inkjet Plotter:** It is a type of Pinch Roller Plotter, which produces an image, with the help of showering little drops of ink on the paper.
5. **Cutting Plotter:** It is a new generation device that allows users to cut different shapes. It is mainly used for advertising, sign-making, bill board, and vehicle graphics.

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Advantages of a Plotter:

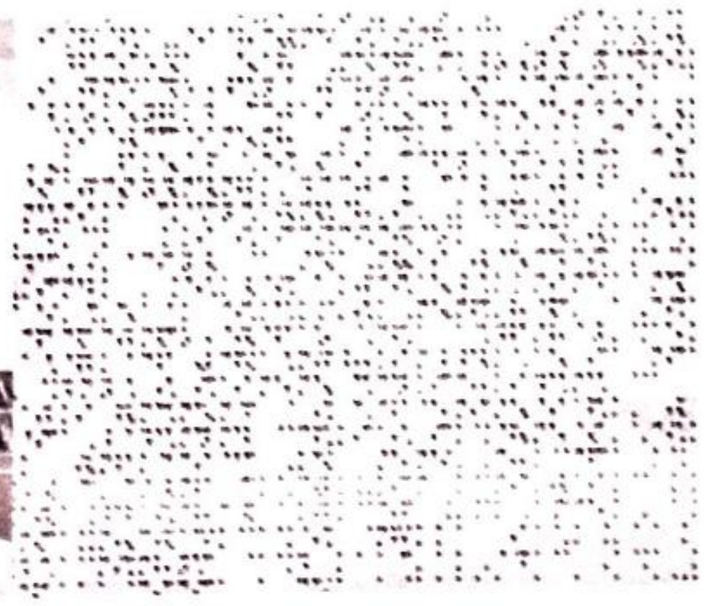
- A Plotter is capable of working on a large sheet around 2 feet or more with better quality.
- It can print on a sheet, of steel, plastic, aluminium, plywood, and any flat sheet material, including paper.
- It can save all templates and patterns on the disk. Thus, it can overcome the problem to loading the same pattern again and again.
- Furthermore, it can draw the same pattern a thousand times without any degradation.

Disadvantages of a Plotter:

- The size of a plotter is larger than that of traditional printers.
- A plotter is more expensive as compared to a traditional printer.

Braille Printers

Braille is a form of written language for blind people, in which characters are represented by patterns of raised dots that are felt with the fingertips.



A braille printer, also known as a braille embosser, is an impact device that creates tactile dots on sturdy paper, making written documents accessible to the blind.

Braille printers receive data from computer devices and emboss that information in braille onto paper, through the use of solenoids that control embossing pins. Braille printers typically print on heavyweight paper and use up more pages for the same amount of information than pages printed

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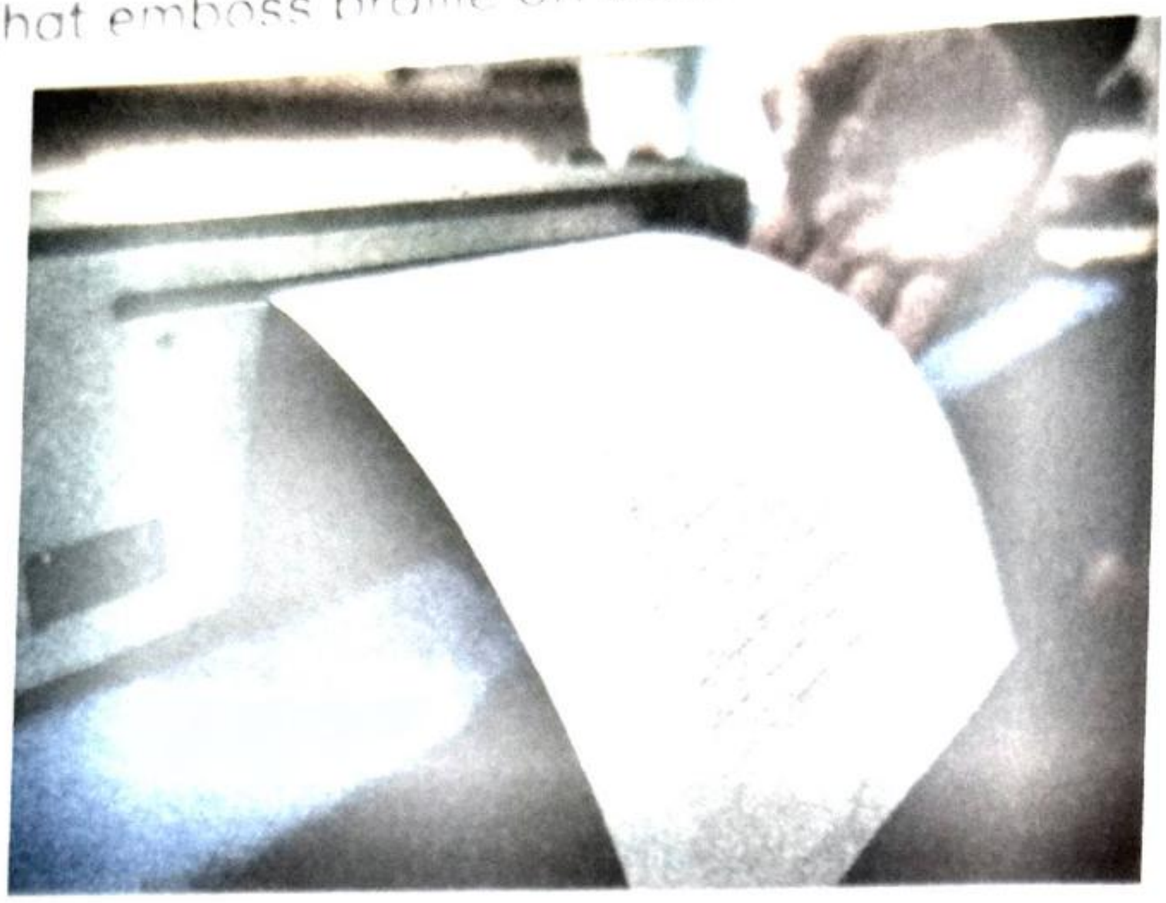
on a regular printer. They are also slower and noisier. Interpoint printers are braille printers that emboss braille on both sides of a page.



3D (three dimensions) Printers

3-D printers are primarily used in computer-aided design (CAD) applications to create three-dimensional objects. They are primarily based on inkjet and laser printer technology and can produce solid objects that work.

The solid object is built up layer by layer, using materials such as powdered resin, powdered metal, plastics, paper or ceramic. Below are some examples of objects printed with the 3D printer.

Various types of 3-D printers exist; they range from the size of a microwave size oven up to the size of a small car. 3-D printers use additive manufacturing, (i.e., the object is built up layer by layer). This is in sharp contrast to the

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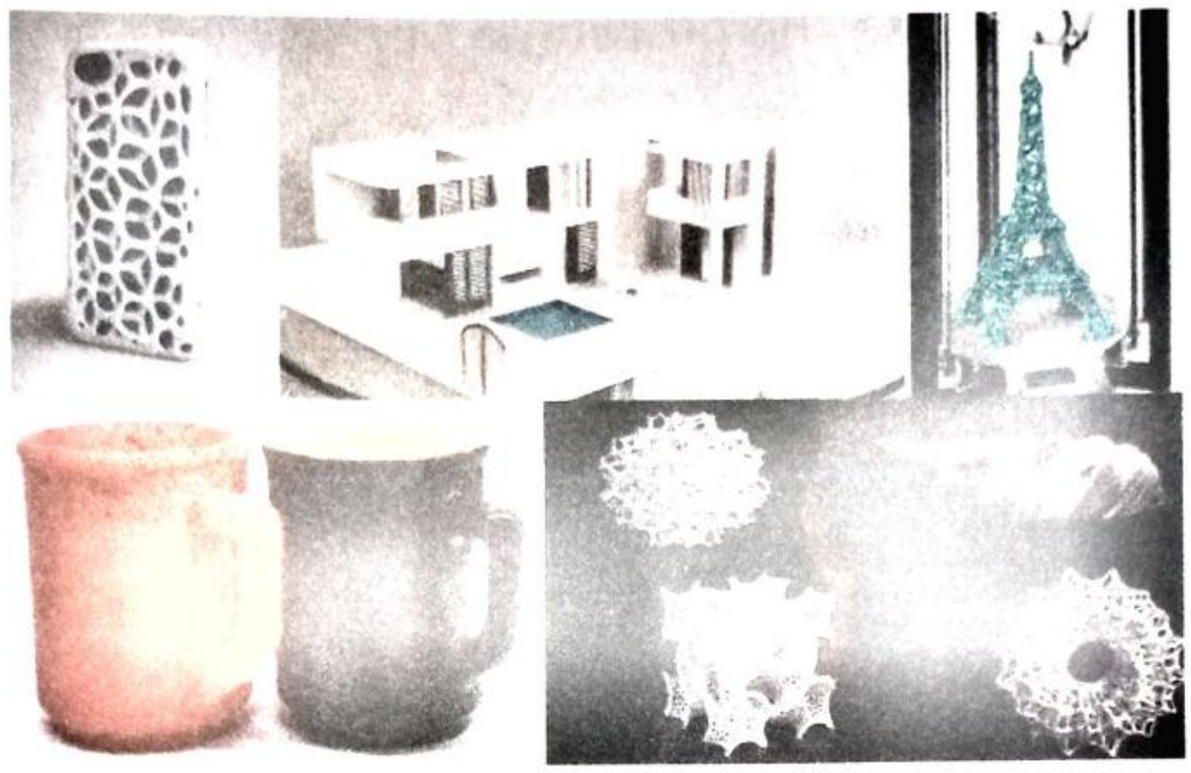
more traditional method of subtractive manufacturing which is the removal of material to make an object. For example, making a statue using a 3-D printer would involve building it up layer by layer, using powdered stone until the final object is formed. The subtractive method would involve carving the statue out of solid.



Application of 3D printers

There are many applications where 3D printers are used, such as archaeology, aerospace engineering, information systems, dentistry, and biotechnology.

- 3D-printed prosthetic limbs is used to fit exactly on to the injured body part.
- making items to allow precision reconstructive surgery (for example, facial reconstruction following an accident); the parts made by this technique are more precise in their design as they can be made from exact scanning of the skull.
- in aerospace, manufacturers are looking at making wings and other aeroplane parts, using 3-D technology; the bonus will be lightweight precision parts.
- fashion and art - 3-D printing allows new creative ideas to be developed.

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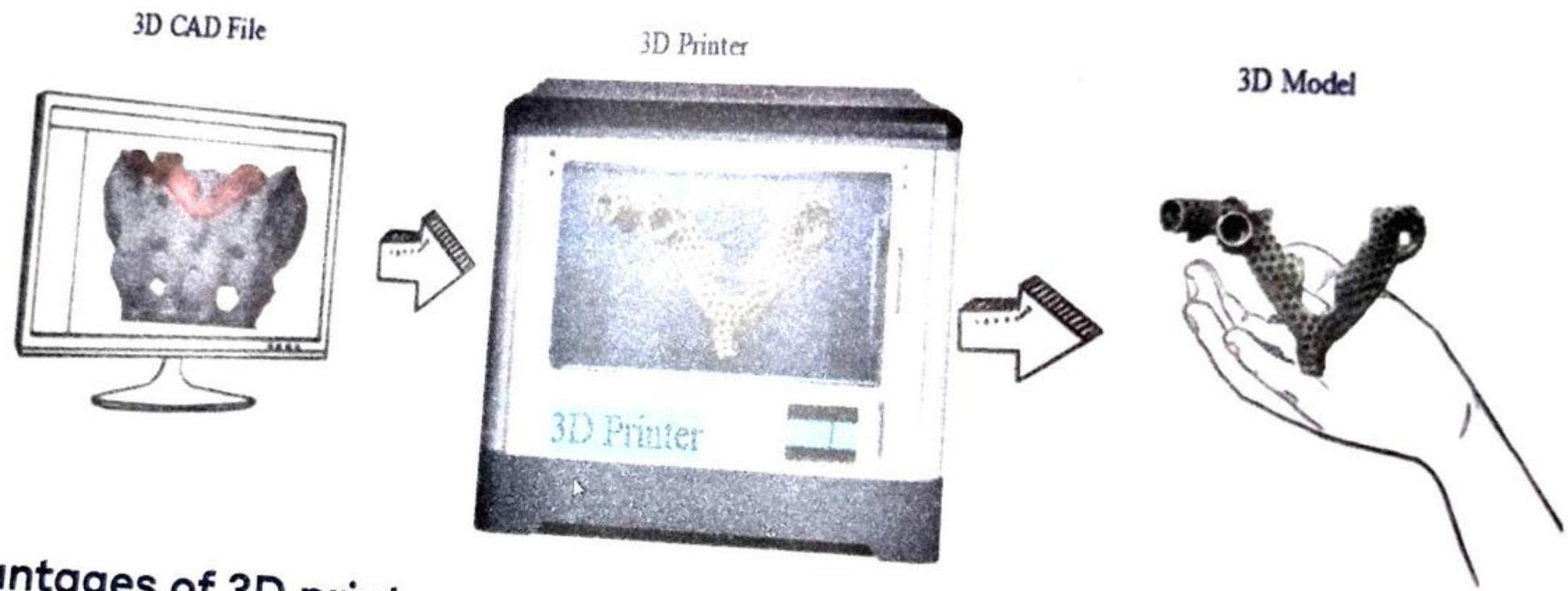
How does a 3D printer work?

Generally, the design of an object starts in a computer-aided design (CAD) software system where its prototype is created. Then, the computer-aided design system sends this prototype to the printer in STL (stereolithography) file format. The printer then starts the process of recreating the object layer-by-layer after reading the prototype in cross-sections.



Advantages of 3D printer:

- It allows users to create their designs and print then in a solid form (3 Dimension).
- It allows manufacturers to create a rapid prototype of items.
- 3D printing reduces the costs involved in manufacturing a product.
- The cost of manufacturing, using 3-D printers is the same for both small-scale and mass-scale.
- Medical benefits are emerging, such as producing artificial organs, prosthetics and precision-made items for reconstructive surgery.
- Parts for machinery that are no longer made could now be manufactured using 3-D printers. For example, the blue print of the part of a 1930s car can be printed using an industrial 3D printer.
- It has the ability for full customization.
- It is easy to access and is cost-effective compared to manufacturing by hand.
- It prints better-quality objects, with excellent finishing.
- It provides users with the ability to create complex geometric shapes which would have been difficult to manufacture by hand.

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Disadvantages of 3D printer:

- 3-D printer can be used to make counterfeit items or items that infringe on others' copyright.
- 3-D printers could be used to manufacture dangerous items by almost anyone.
- There is the potential for job losses if this technology takes over various forms of manufacturing.
- Its initial and resin costs are high.
- 3D printing is still a developing technology.
- It consumes high energy around 50 to 100 more than injection moulding.
- It includes limited materials.
- 3D printers are slow as they are limitless for mass customization.

Impact and non-impact printer

1. Impact Printers

Impact printers use an Electro-mechanical mechanism. An impact printer refers to all those printers whose printing heads touch the paper. This mechanism uses hammers or pins to strike against a ribbon and paper to print the text or image.

2. Non -Impact Printers

These printers use ink and special electrical machines for producing outputs. Non – impact printers are all those printers whose printing heads do not touch paper. A non-impact printer forms characters and images on a piece of paper without actually striking the paper.

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Comparison Chart Between Impact & Non-Impact Printers

S. N.	Features	Impact printer	Non-Impact printer
1	Mechanism	It produces print on paper by striking mechanism.	It produces print on paper with a non-striking mechanism. it uses Electro static or thermal mechanisms.
2	Working	It uses pins, hammers or wheels to strike against an inked ribbon to print on paper.	It uses a laser, a spray of special ink, or heat and pressure to print on paper.
3	Colour output	Impact printers have no colour capacity	Non-Impact printer can print clear colour, good for printing pictures
4	Cost	Impact printer are normally less expansive.	Non-Impact printer is more expansive.
5	Graphics Image	Except for dot matrix printers, this printer can not print graphics images	This printer can easily print graphical images
6	Tools	Impact printer uses special inked ribbons to produce print on paper when the print head strikes.	Non-Impact printer uses toner or cartridges for printing on paper.
7	Speed	Impact printer is a low speed printer.	Non-Impact printers are very fast. It can print many pages per minute.

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8	Sound effects or Noise	Impact printers are high noise levels because they strike the print heads.	Non-Impact printers do not make a noise level because they do not use a striking mechanism in which the print head strikes on ribbon and paper, etc.
9	Character style	The character style can not be changed in the impact printer (except for the dot matrix)	It can print different types of characters from busing the individual printer.
10	Copy print	Impact printers can produce multiple copies of the text.	Non-impact printers can produce only a single copy of the text
11	Technology	Impact printers use old printing technologies.	Non-impact printers use the latest printing technologies.
12	Examples	Dot matrix, Daisy wheel printers, Drum Printers Chain Printers, etc.	Laser printers, Inkjet printers and Thermal Printers etc.

Group Work

In groups of five (5) (depending on class population), each group should discuss the uses of output devices, such as Braille printers, Impact, Inkjet, Thermal, and 3D printers

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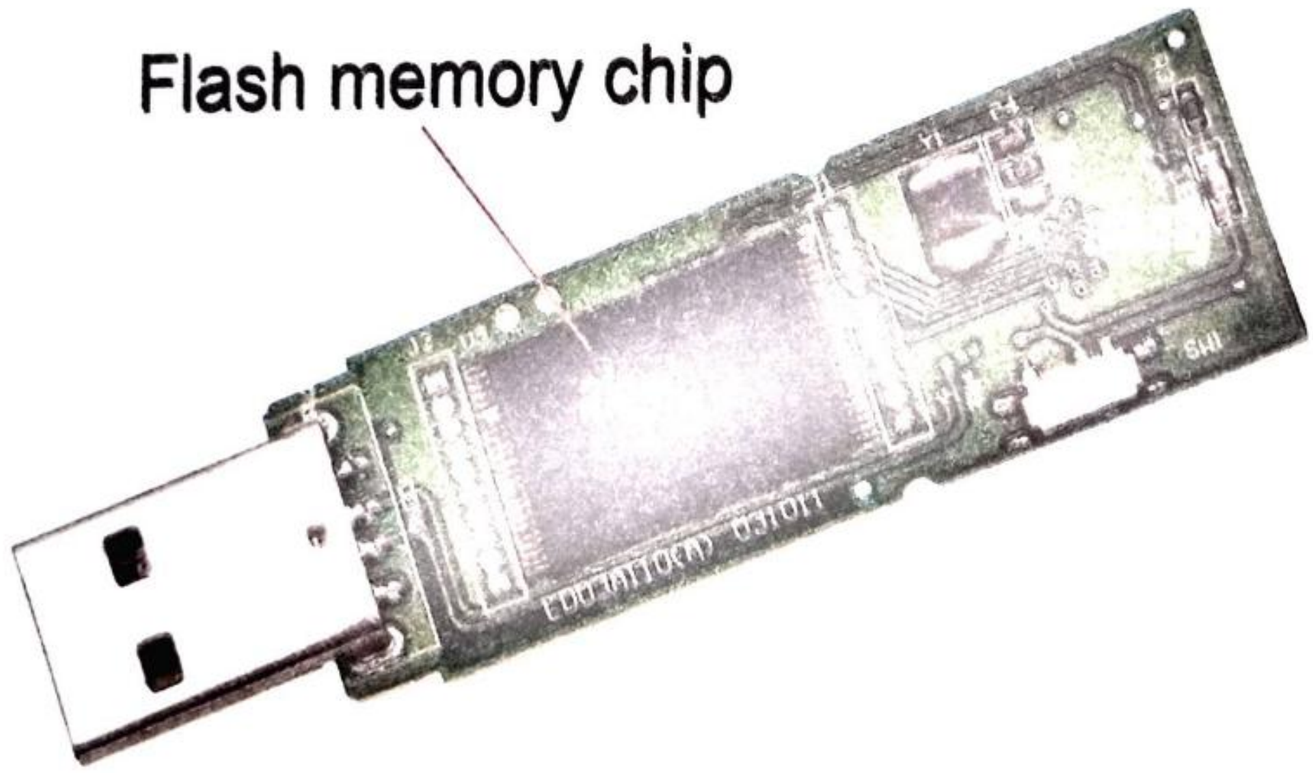
B8.1.1.1.4 Describe storage devices: Flash Memory Storage Systems, Embedded Flash Memory Cards and Readers, USB Flash Drives, Solid State Drives and Hybrid hard drives.

Flash Memory Storage Systems

Flash memory storage systems are long-life and non-volatile memory chips that are used for data storage. They can keep stored data and information even when power is off. Data can be electrically erased, reprogrammed or written on flash memory storage systems. Flash Memory Storage Systems were developed from EEPROM (electronically erasable programmable read-only memory). It must be erased before it can be rewritten with new data. Unlike magnetic storage such as Hard Disk Drives (HDD), flash memory storage systems have no moving parts and all data is retrieved at the same rate, no matter where it is stored.



There are two types of flash memory systems which dominate technology and market: NOR flash and NAND flash. NOR flash memory uses the NOR logic gate and NAND flash memory uses NAND logic gate.

Examples of storage devices that use flash memory include:

- Flash memory cards and readers
- USB flash drives
- Solid state drives
- Hybrid hard drives.

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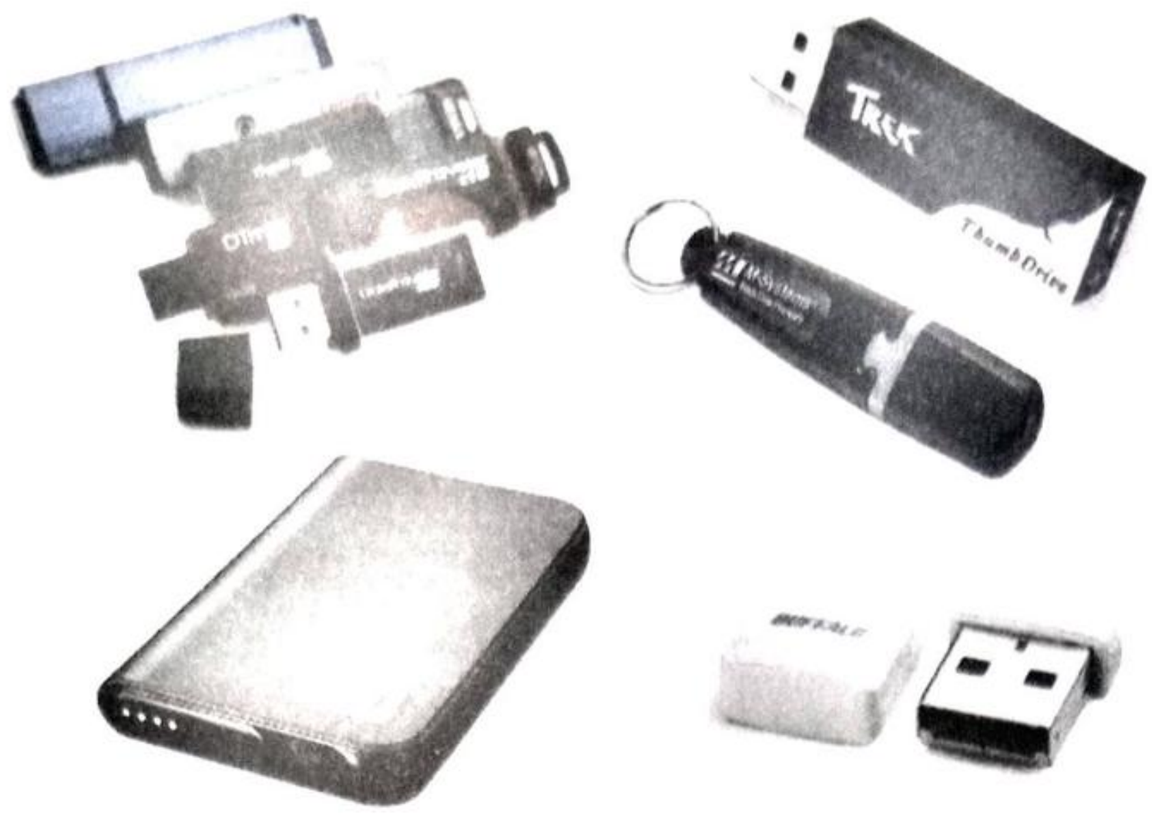

Flash memory storage devices

Embedded flash memory cards and readers

Flash memory cards are small storage device that uses nonvolatile semiconductor memory to store data on portable computing devices. Flash memory cards come in various types and formats, providing removable storage for digital equipment like camcorders, cameras, MP3 players and cell phones. They store data such as text, pictures, audio and video.

Advantages

- Faster to read and write compared to traditional hard disk drives.
- Very small in size so they are easy to transport files from one device to another (for example from a camera to a computer)
- Robust and less prone to damage.
- Cheaper than traditional drives in small storage capacities.
- Use less power than traditional hard disks.
- Easy to connect to mobile devices, such as cell phones and cameras.
- They are non-volatile
- They are not affected by magnetic fields, unlike traditional hard

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drives.

- They are plug-in friendly and easy to use.

Disadvantages

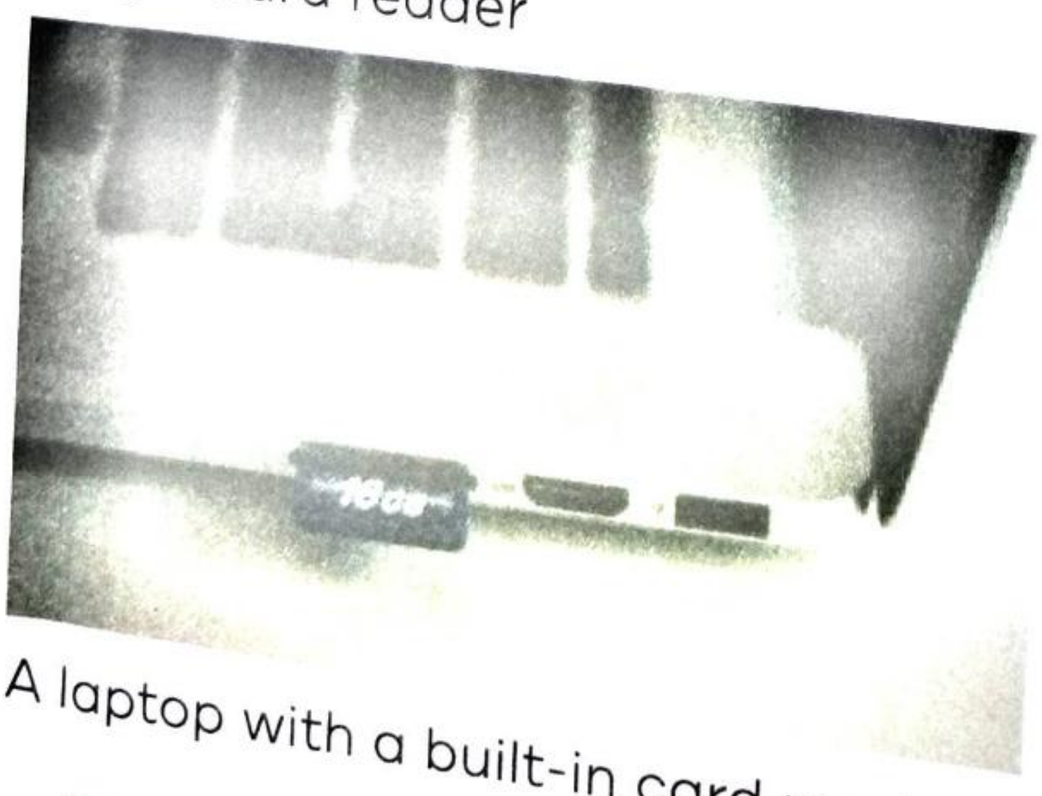
- They have a limited number of write and erase cycles before failing.
- They are easier to lose because of their smaller size.
- They can easily be infected by a computer virus.
- They can physically be worn out.
- Heavy write load degrades the drive.

Memory card readers

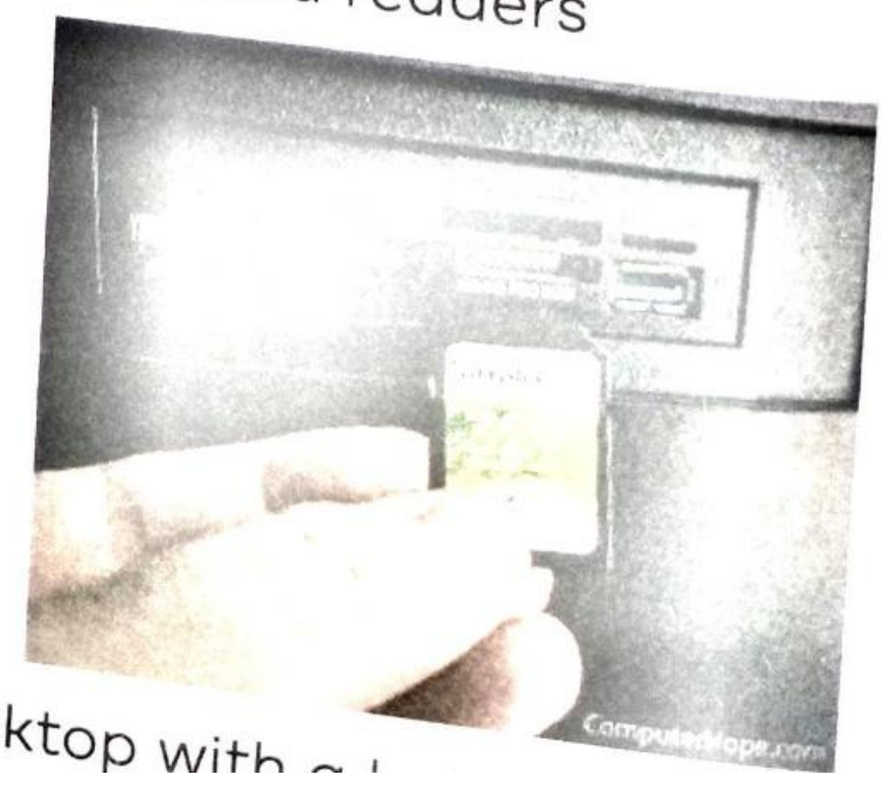
Memory card readers are hardware devices for reading and writing data on a memory card. These devices can read flash memory cards and transfer their contents to a computer. There are single and multiple card readers, and while the former can only read a single memory card type, the latter can read a variety of formats. Some laptops and desktop computers come with built-in memory card readers.

Single card reader

multiple card readers



A laptop with a built-in card reader



A desktop with a

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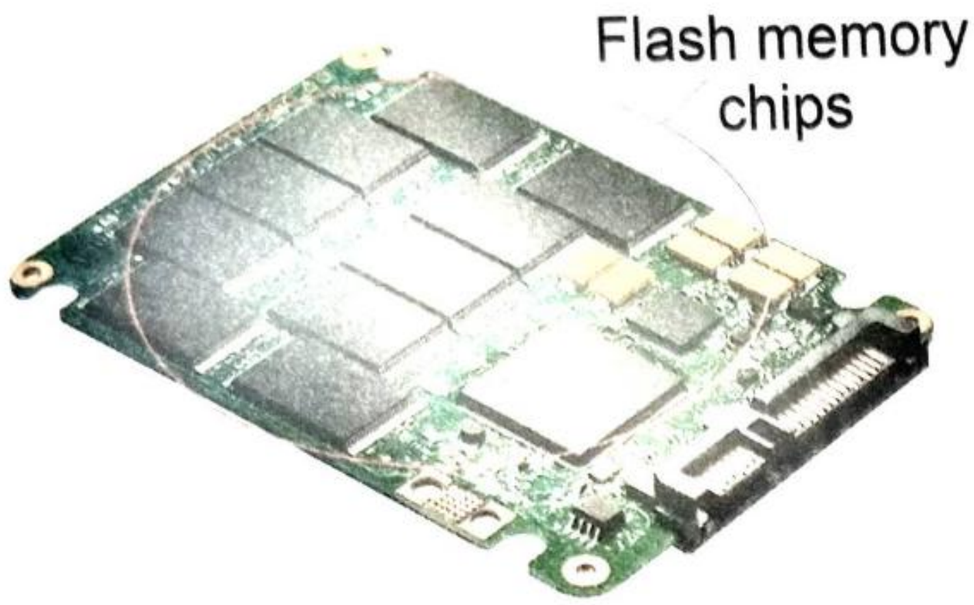
USB Flash Drives

Solid state drives (SSD)

Solid-state drives (SSD) are a new generation of storage devices aimed at replacing traditional mechanical hard disk drives (HDDs). SSDs use flash-based memory rather than spinning disks, making them faster, more reliable and more energy-efficient



Advantages

- They are more reliable (no moving parts to go wrong)
- They are considerably lighter (which makes them suitable for laptops)
- They don't have to get 'up to speed before they work properly
- They have a lower power consumption
- They rim much cooler than HDDs (both these points again make them very suitable for laptop computers)
- Because there are no moving parts, they are very thin
- Data access is considerably faster than HDD.

Disadvantages

- They are more expensive than traditional hard drives.
- They currently offer less storage space than traditional hard drives.
- They slow down as you fill them up. Fill your solid-state drive to near capacity and its writing performance will decrease dramatically.
- In event of data deletion on SD, it is almost impossible to recover the data.
- They are limited to a certain number of writes.
- They are hard to find on the market.

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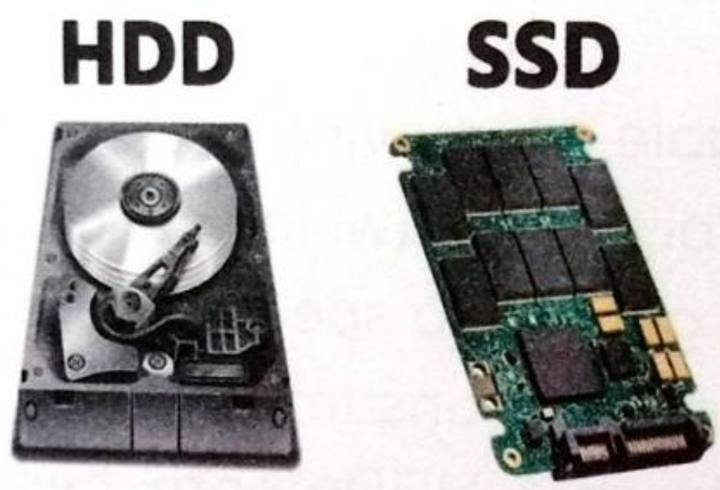
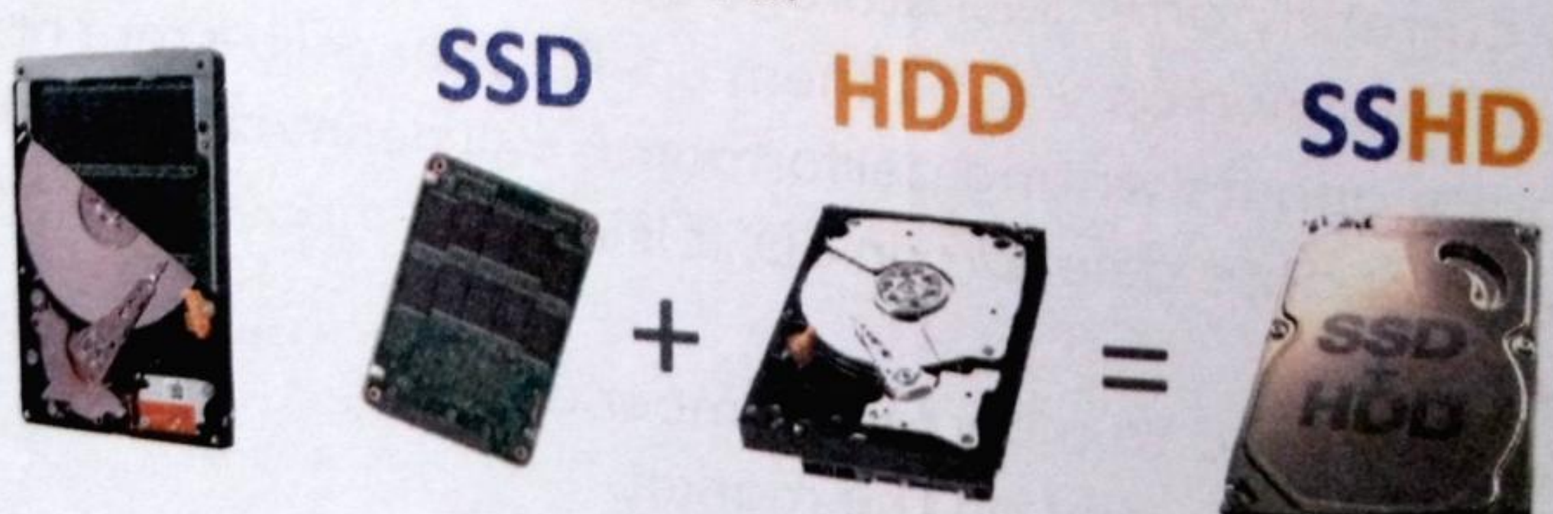
Differences between HDD and SSD.

Hard Disk Drives (HDD)	Solid-state Drives (SSD)
It has rotating platters and mechanical arms.	No moving parts.
The reading and writing period for data in HDD is slower.	The reading and writing period for data in SSD is quicker.
Longer response time.	Quick response time.
Because of the moving parts, HDD creates much should.	SDD does not make a sound.
Greater risk of data loss and hard drive failure when transported.	Little or no risk of data loss.
High energy consumption.	Low energy consumption.



Hybrid hard drives

A hybrid hard drive (HHD), sometimes known as a solid-state hybrid drive (SSHD), is a storage device that combines a conventional hard disk drive (HDD) and a solid-state flash (SSD) module for data storage. An HHD blends the capacity, cost and performance of physical HDD storage with accelerated performance of flash SSD.



Hybrid hard drive

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Advantages

- They accelerate data storage and retrieval for applications such as word processors.
- They reduce the time for system booting.
- They reduce power consumption.
- They decrease heat generation.
- They extend hard drive life.
- They extend battery life for laptops, notebooks and PDAs.
- They diminish levels of operating noise.

Disadvantages

- Longer seek time for data stored on the hard drive
- More frequent HDD spin up and spin down
- Impossibility of data recovery from failed flash memory modules
- The higher overall hardware cost for the system
- Major hybrid hard drive vendors

Group Work

In groups of five (5) (depending on class population), each group should discuss the features of storage devices such as Flash Memory Storage, Systems, Embedded Flash Memory Cards and Readers, USB Flash, Drives, Solid State Drives and Hybrid hard drives

B8.1.1.2.1 Explore the use of the Charms bar

The Windows Charms is a feature of Windows 8 and 8.1 which provides access to Windows Search, Sharing, Start menu, Devices, and Settings. The menu appears when the mouse cursor is positioned at the top-right or bottom-right corner of the Windows 8 GUI.

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Group Work

In groups of five (5) (depending on class population), each group should explore the use of the Charms bar for Searching, Sharing, and launching the Start menu, Devices, and Settings.

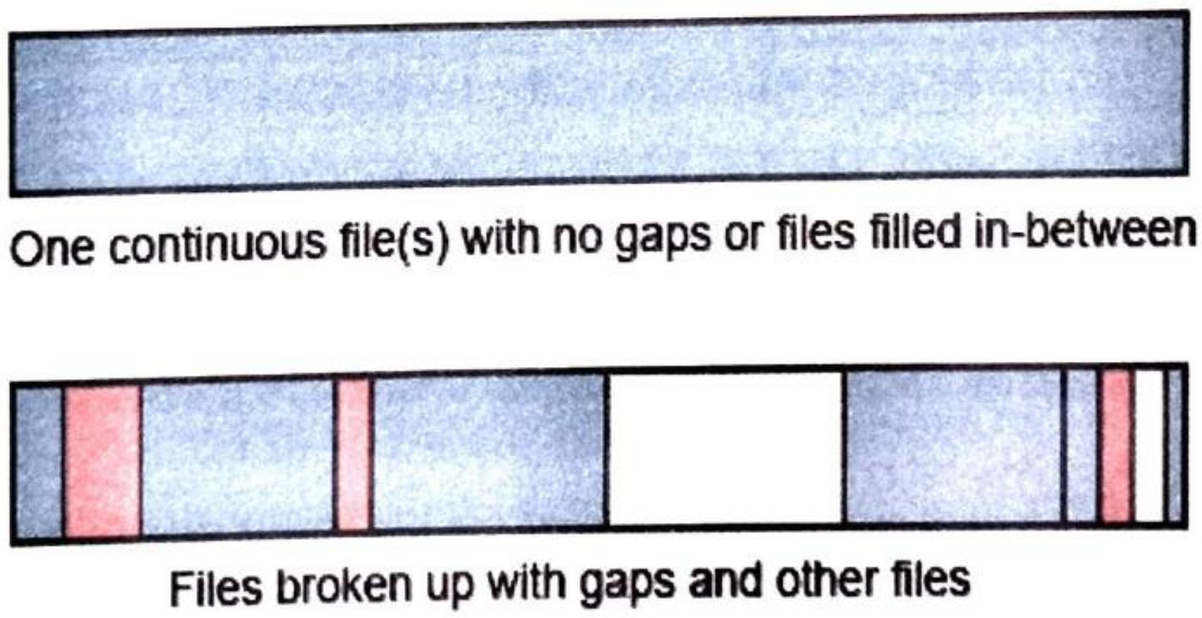
B8.1.1.2.2. Practise file management techniques (Drive Management)

Defragmentation

What is file fragmentation?

File fragmentation occurs if the data for a file are scattered throughout a hard drive platter instead of in one continuous location. Fragmentation is caused when information is deleted from a hard drive and small gaps are left behind to be filled by new data. As new data is saved to the computer, it is placed in these gaps. If the gaps are too small, the remainder of what needs to be saved is stored in other available gaps. The image below shows an example of file fragmentation. As you can see, the lower half has other files and gaps in between what should be a continuous blue section.

Example of File Fragmentation



Fragmentation causes slow access time because the read/write head accessing the data must find all fragments of a file before it can be opened or executed. Fragmentation can decrease the computer's performance.

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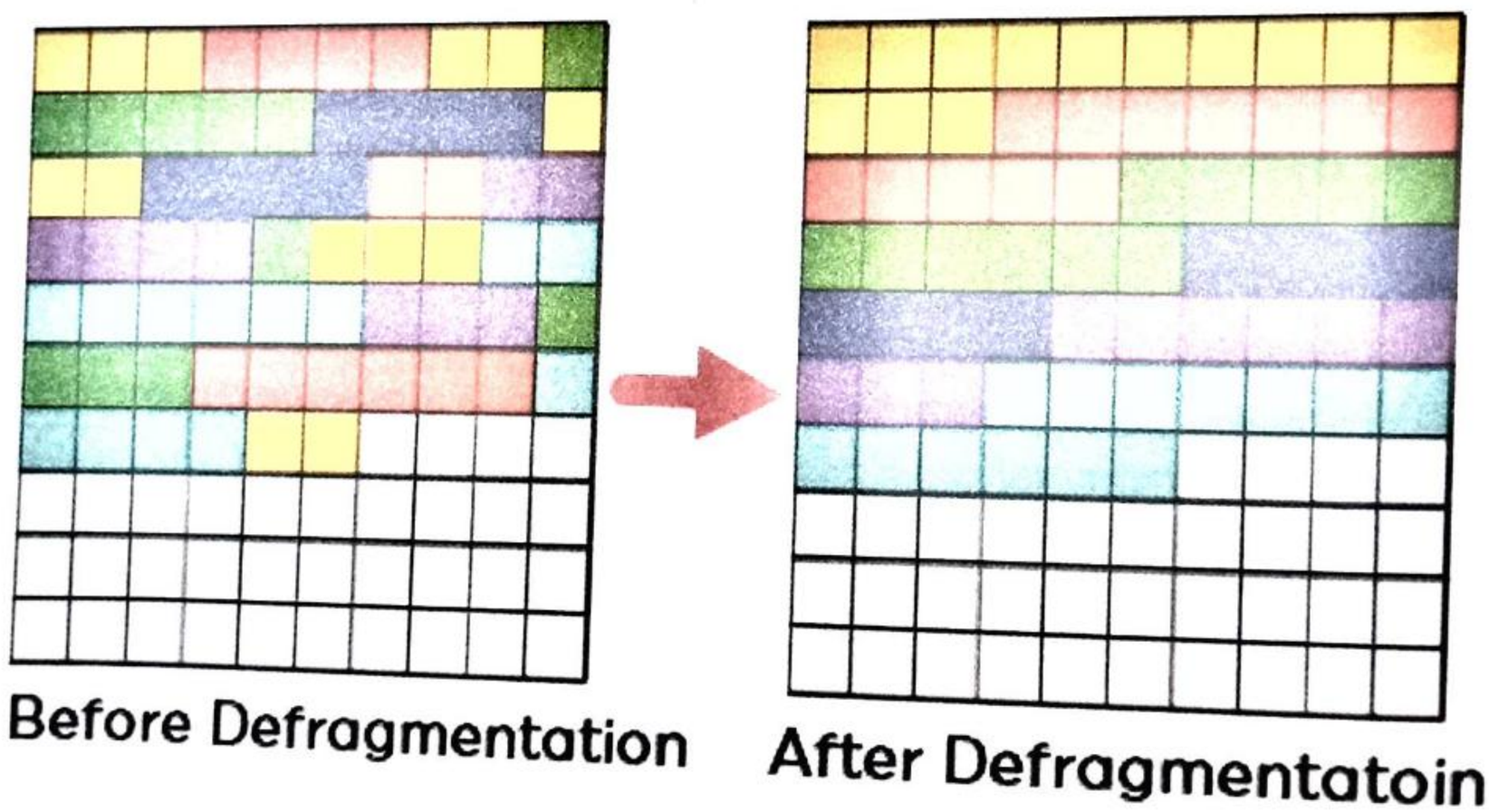
Effects of file fragmentation

- Applications lagging or responding slowly
- Slow backup times
- Increase in the time for each input/output (I/O) operation
- Inefficient disk caching
- Slows down in read and write for files
- High disk thrashing (the constant writing and rewriting of small amounts of data)
- Long virus scan times

What is defragmentation?

Defragmentation, also known as "defrag" or "defragging", is the process of reorganizing the data stored on the hard drive so that related pieces of data are put back together, all lined up continuously.



Importance of defragmentation

- It increases computer performance.
- Defragmentation increases the proficiency of accessing data and prevents file fragmentation.
- it can decrease the time it takes to run a program and open files on a hard disk drive.

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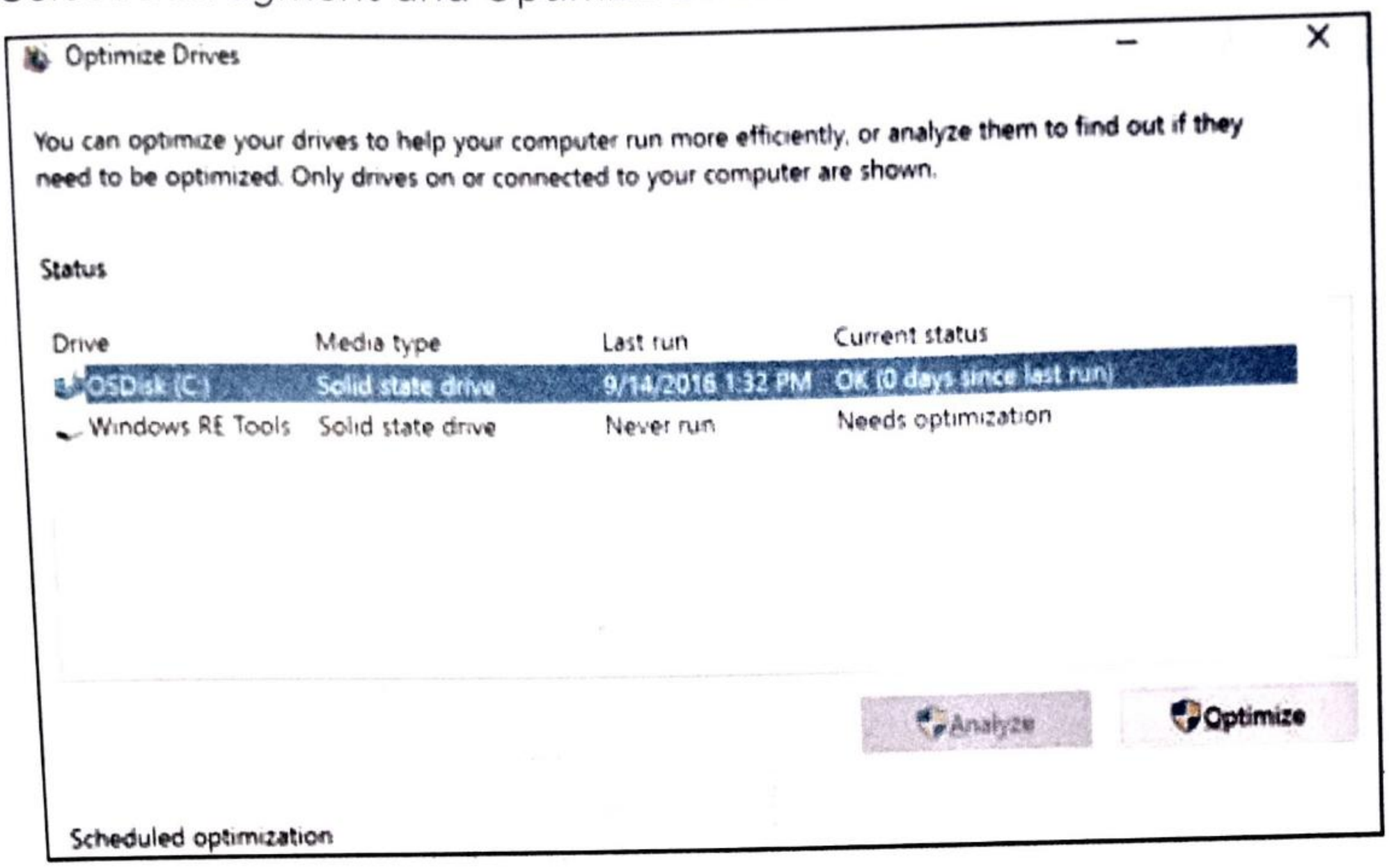
How to defragment hard disk drive

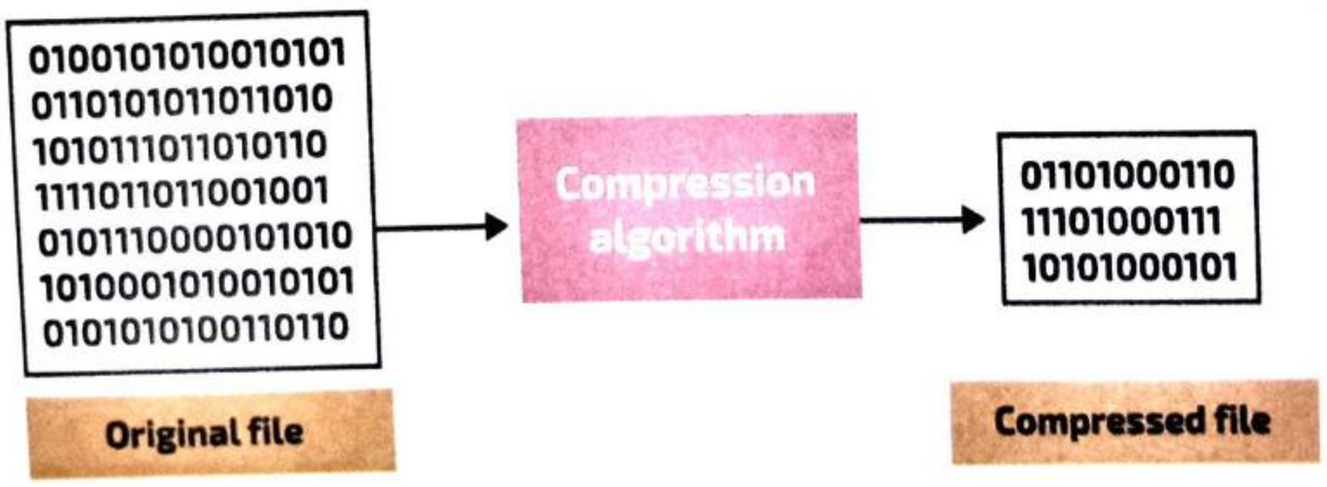
1. Select the search bar on the taskbar and enter defrag.
2. Select Defragment and Optimize Drives.



3. Select the disk drive you want to optimize.
4. Select the Optimize button.

File Compression

File compression is the process of making computer files take up less space on your computer by reducing the size of the file. This is done by encoding the file data to use fewer binary digits (bits) of storage than the original file. File compression packs data into a smaller digital form



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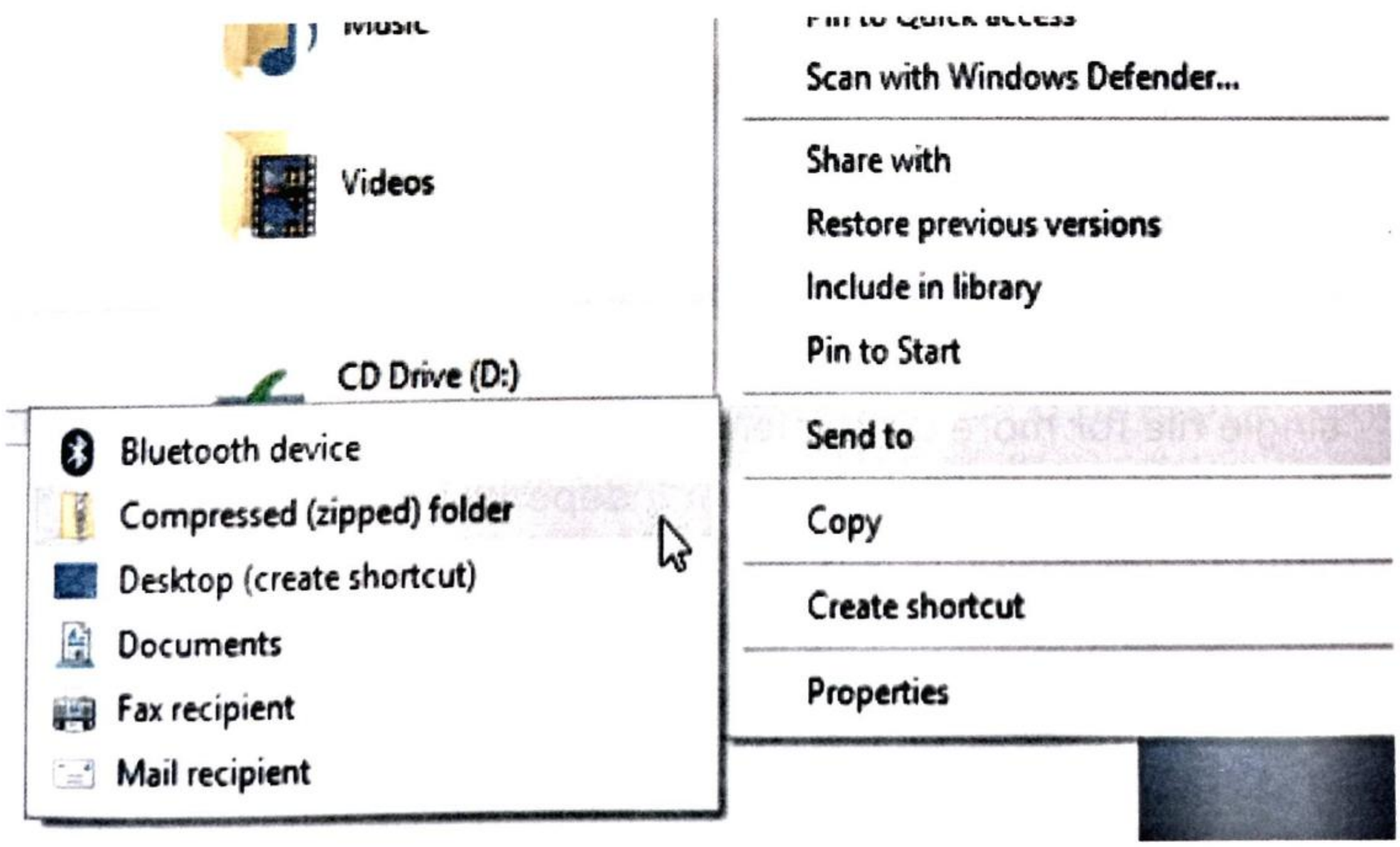
Lossy compression

Lossy compression algorithms reduce the size of files by discarding the less important information in a file, which can significantly reduce file size but also affect file quality. It is used for images, video and audio files where a perfect representation of the source media is not required. For example, an MP3 audio file does not contain all the audio information from the original recorded. Instead, lossy compression of MP3 files removes sounds that humans cannot hear. Lossy compression takes advantage of the limits of human senses and our ability to fill in "gaps." Our brains have a remarkable ability to interpret information, even when some of the data might be missing from an image or audio file. As a result, many multimedia files are compressed versions of originals, but the compression does not remove so much information that our brains would notice the difference.

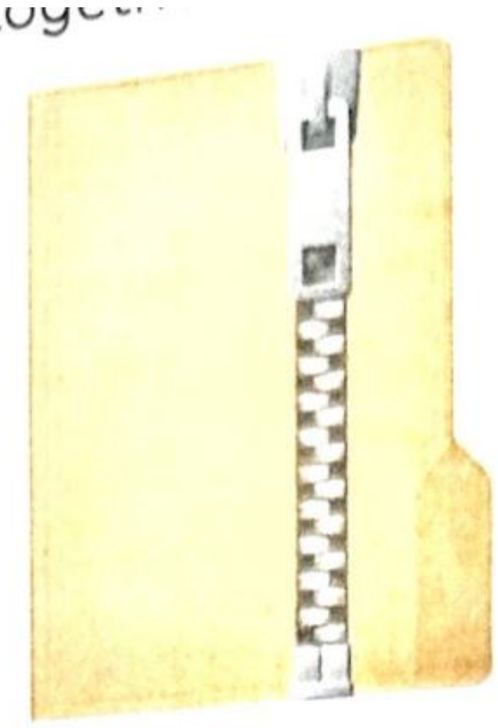
How to compress a file (ZIP files)

1. Open the file explorer and then select the file(s) you want to compress.
2. Right-click the file you want to zip, and then select **Send to > Compressed (zipped) folder.**



Scanned by TapScanner

This will compress the files toget



Zip Folder

How to unzip a file

- Open File Explorer and find the zipped folder.
- To unzip the entire folder, right-click to select Extract All, and then follow the instructions.
- To unzip a single file or folder, double-click the zipped folder to open it. Then, drag or copy the item from the zipped folder to a new location.

Advantages of file compression

- It helps to occupy less disk space or storage space. This is because when compressed, the quantity of bits used to store the information is reduced.
- Compressed data is read/written faster than original data.
- It enables faster file transfer on the internet due to a reduction in file size. Moreover file compression can zip up several small files into a single file for more convenient email transmission.
- Data compression is byte order independent.
- Data compression has a variable dynamic range which depends on the algorithm used during compression.

Disadvantages of file compression

- Compression is time-consuming when we have a large number of files to be compressed.

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- Data compression algorithms are system-intensive processes and will take up valuable resources during the data compression process. It sometimes pops up an "out of memory" error in some of the systems having fewer resources than required by the data compression algorithm.
- To decompress the downloaded compressed file, one requires an appropriate program to un-compress it. Often, the user does not find such a program available on the system or the Internet.

Hard disk partitioning

File compression is the process of making computer files take up less space on your computer by reducing the size of the file.

How to partition a hard disk

Drives can be split into different partitions to treat the drive as if it contained multiple regions. Partitioned drives have multiple uses which can improve performance and optimize software interaction between different drive regions. This article will cover different kinds of partitions, the pros and cons of partitioning a drive, how to partition a drive, and finally, what partitions to expect within Windows 10.

Different Drive Partitions

Partitioning a drive is when you create one or more regions on a hard drive or solid-state drive. The regions created are generally called partitions or volumes which refer to a defined storage space on a drive. It essentially makes a single, physical disk drive appear as multiple disks. There are different types of partitions with the main ones, including:

Primary Partition: Contains one file system and typically stores the boot files for the primary operating system. Can be set active and has a max of 4 primary partitions on MBR disks.

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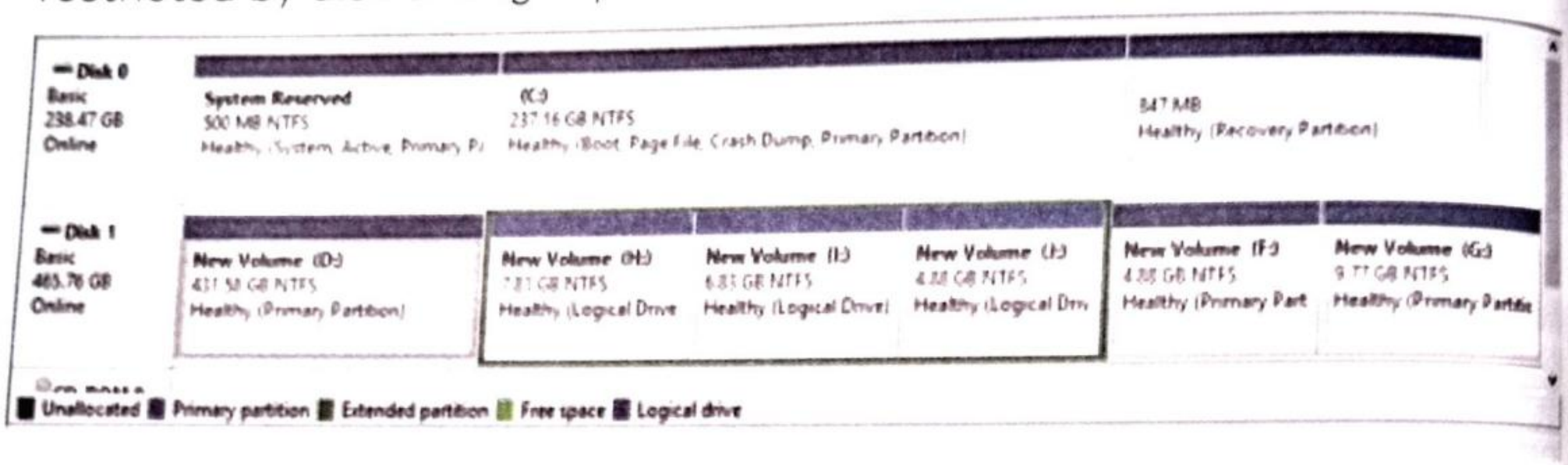
Extended Partition: A defined area where logical drives are stored. Max of one partition per drive.

Logical Partition: Can be used to store data, but can't boot an operating system. Often used as an organizing tool. Limit of logical partitions only restricted by disk storage space.



In our example, Disk 1 has multiple primary partitions and an extended partition with multiple logical drives. The colour key is great for showing the different types of partitions.

Advantages and disadvantages of Drive Partitioning

The benefits generally outweigh the disadvantages, but It is important to understand when to partition a drive. Sometimes it is unnecessary or inefficient to break up a drive into different partitions. Below is a table with some of the pros and cons to consider before splitting up a drive.

Advantages	Disadvantages
Separates OS and program files to optimize interaction with the operating system.	Reduces the total space available for storage on the drive.
Better organization to allow frequently-used data and programs to be near each other.	Reduces performance on HDDs when accessing data frequently on different partitions (does not affect SSDs).
Allows multi-boot setup options.	Prevents using the whole disk capacity for a single large folder/ file/application.

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Protects and isolates files.

Enables image backups to be made of only the operating system and installed software.

Important note: Be sure you have any necessary data backed up before doing any type of drive manipulation.

How to Partition a Drive

When a new hard drive/ solid state drive is first installed in a system, it must be initialized and then partitioned before it is formatted to be usable. There are different tools and commands to perform drive partitioning, but this article will cover using the Disk Management tool within Windows 10.

1. Launch Disk Management by right-clicking the Windows start button and selecting "disk management".
2. If it is a new drive or a blank drive, skip down to Step 5. Otherwise, select the disk you want to partition and right-click the drive to bring up options.
3. Select "Shrink" to free up space from the existing volume.
4. 4. Enter the size of the new partition you wish to make.
5. 5. You should have an area that now says "Unallocated space." Right-click this area and select "New Simple Volume" and a Wizard will come up to guide you through the steps.
6. First, you will specify the volume size.
7. Next, you will assign a drive letter or set a path.
8. Now you will format with the file system and finalize your new partition.

Group Work

In groups of five (5) (depending on class population), each group should practise file management techniques such as defragmentation, file compression and partitioning of a hard disk.

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Knowledge-based assessment

1. Fifth generation of computers used.....
   A. Artificial intelligence
   C. Vacuum-tube Based
   D. Transistor Based

2. The use of the behaviour of sub-atomic particles for computer processing is known as.....
   A. Artificial Intelligence
   B. Quantum Computing
   C. Parallel Processing
   D. Integrated Circuit

3. Using multiple processors simultaneously to execute the same task is called.....
   A. Artificial Intelligence
   B. Quantum Computing
   C. Parallel Processing
   D. Integrated Circuit

4. Which of the following is an impact printer?
   A. Dot matrix printer
   B. Inkjet printer
   C. LaserJet printer
   D. Thermal printer

5. One of the following hard disks has a non-moving part.
   A. Hard Disk Drives
   B. Solid-State Drives
   C. Hybrid Drives
   D. Optical Disk Drives

6. The term used to describe data that are scatted throughout a hard drive platter is known as.....
   A. Flash Memory
   B. Solid State
   C. Fragmentation
   D. File compression.

7. The process of reorganizing data on a hard drive by continuously putting pieces of data is called.....
   A. Formatting
   B. Partitioning
   C. Defragmentation
   D. File compression.

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8. The process of making computer files take less space on the computer is known as.....
   A. Formatting
   B. Partitioning
   C. Defragmentation
   D. File compression.

9. Which of the following files can be compressed using a lossy compression algorithm?
   A. Document
   B. MP3 File
   C. Programme files
   D. Pictures

10. The compression algorithm that discards less important information about a file is known as.....
   A. Lossy compression
   B. Lossless compression
   C. compact compression
   D. Zip compression.

T Theory questions

1. (a) What is a fifth-generation computer?
   (b) State *four* features of a Fifth-generation computer.
   (c) Mention *four* advantages of fifth-generation computers.
   (d) Mention *four* disadvantages of fifth-generation computers.

2. (a) What is quantum computing?
   (b) Tabulate *two* major differences between quantum computing and regular computing.
   (c) Mention *three* uses of quantum computing.
   (d) State *two* advantages and disadvantages of quantum computing.

3. (a) What is parallel processing?
   (b) Outline *four* uses of parallel processing.
   (c) State *three* advantages of parallel processing.
   (d) State *three* disadvantages of parallel processing.

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4. (a) What is artificial intelligence software?
   (b) Describe the following types of Artificial Intelligence Software:
      (i) Chatbots
      (ii) Deep Learning Software
      (iii) Machine Learning Software
      (iv) Artificial Intelligence Platforms.
   (b) Give *four* examples of artificial intelligence software.

5. (a) What is a data entry device?
   (b) Briefly describe the uses of the following data entry devices:
      (i) Graphic tables
      (ii) Magnetic card reader
      (iii) QR code reader
      (iv) Radio Frequency Identification (RFID) Reader.
   (c) State *two* advantages of each of the devices in 5 (b) above.
   (d) State *two* disadvantages of each of the devices in 5 (b) above.

6. (a) What is an output device?
   (b) Briefly describe the uses of the following output devices:
      (i) Braille printers
      (ii) Thermal wax printers
      (iii) 3D printers
      (iv) Plotters
   (c) State *two* advantages of each of the devices in 6 (b), above.
   (d) State *two* disadvantages of each of the devices in 6 (b), above.

7. (a) What is flash memory?
   (b) Give *two* examples of flash memory.
   (c) Tabulate *two* differences between Solid State Drive (SSD) and Hard Disk Drive (HDD).
   (d) Mention *three* advantages and disadvantages of a Hybrid Hard Drive (HHD).

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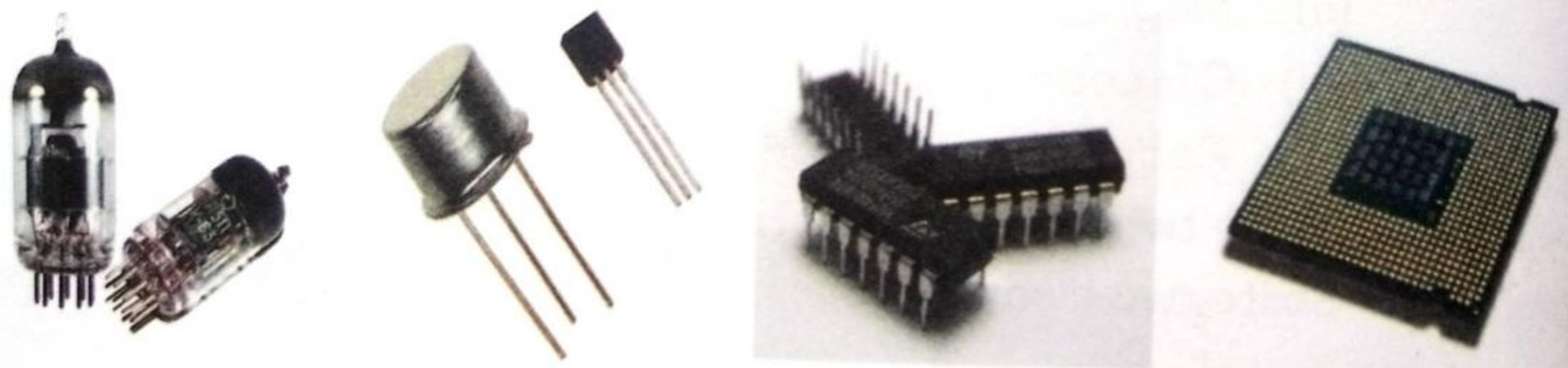
8. (a) What is meant by the term defragmentation?
   (b) State *two* important features of disk defragmentation.
   (c) What is file compression?
   (d) Briefly explain the following types of file compression:
      (i) lossless compression
      (ii) lossy compression.
   (e) State *two* advantages and disadvantages of disk partitioning.

Practical Test

1. (a) identify the following electronic components.



I II III IV

   (b) Mention the generations of computers that are associated with each component.
   (c) State three differences between the fifth generation of computers as compared with the previous generation of computers.

2. (a) Name the following data entry devices.

I II III IV

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Technology in the Community

SUB-STRAND 1.2

Content standards

B82.1.2.1 Demonstrate the use of Technology in the Community

Indicators

B81.2.1.1. Discuss technologies that help to improve computer accessibility (adaptive and assistive technologies)

B81.2.1.2. Describe how portable computing devices affect our everyday lives

B81.2.1.3. Explain the issues associated with online services (e.g. social media, wikis, blogs, etc.)

Introduction

Have you ever wondered how persons with disability can use technology, such as computers and mobile phones? There are many technologies available that are used by persons with disability to help them in their daily lives. These technologies can be grouped into adaptive and assistive technologies. A special version of already available technology is adapted for persons with disability. Such technologies are called Adaptive Technologies. Additionally, there are special kinds of technology made only for persons with disability to assist them in their daily lives. Such technologies are known as assistive technology. In this lesson, we are going to learn more about adaptive and assistive technologies for different types of disabilities. We will also learn how portable computing devices affect our everyday lives as well as issues associated with the use of social media.

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Teaching strategy

A discussion method of teaching is recommended for this lesson. Guid learners to discuss how adaptive and assistive technologies are used t improve the lives of persons with disability. Guide learners to distinguis between adaptive and assistive technologies and identify examples of eac type. Lead learners to discuss how portable computing devices affect our everyday lives as well as the issues associated with the use of onlin services such as social media, wikis and blogs.

Content link

At this level, we are going to learn about adaptive and assistive technologie for persons with disability. We will also learn about the effects of portable devices and social media on the community. In Basic 9, we will continue this lesson. We will learn how to evaluate, propose and design solutions to problems in the community, and wich can be solved with technology.

Keywords

- Assistive technology
- Portable computing devices
- Adoptive technology
- Mobile computing
- Disability

B8.1.2.1.1. Discuss technologies that help to improve computer accessibility (adaptive and assistive technologies)

A disability is any condition of the body or mind that makes it more difficult for the person with the condition to do certain activities and interact with the world around them.

Different types of disabilities

- Vision Impairment
- deaf or hard of hearing
- mental health conditions
- intellectual disability
- acquired brain injury
- autism spectrum disorder
- physical disability

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Assistive technology

Assistive technology is a technology used by individuals with disabilities to perform functions that might otherwise be difficult or impossible. They include any low-, mid-, or high-tech tool or device that helps people with disabilities perform tasks with greater ease and/or independence. Examples include:

- Screen readers
- Magnification applications
- Text-to-speech synthesizers
- Alternative keyboards
- On-screen keyboards
- Keyboard filters
- Electronic pointing devices
- Sip-and-puff systems
- Wands and sticks
- Joysticks
- Trackballs
- Touch screens
- Braille embossers
- Refreshable braille displays
- Light signaller alerts

These products support hearing, vision, mobility, memory, writing, typing, pointing, walking and learning.

Disability	Assistive technology
Vision Impairment	Audiobooks, Eyeglasses, Brailed materials, large print books, electronic magnifiers, Canes, Service Dogs, JAWS screen reader
Deaf or hard of hearing	Hearing loops, sound amplifiers, personal amplifiers, Bluetooth systems, Infrared systems, and accessories for computers, TVs, tablets and smartphones
Mental health conditions	Audio Notetaker, smartpens, Microsoft to-do apps, Task timer apps
Intellectual disability	Screen readers, voice recognition programs, text-to-speech software, graphic organizers, proof-reading software

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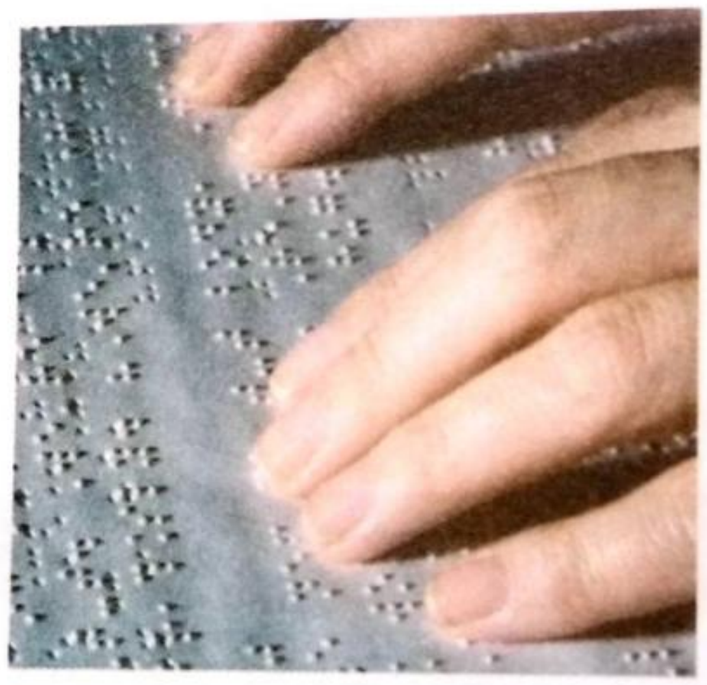
Acquired brain injury	Wheelchairs, scooters and walkers help with mobility and increase independence. Special computer hardware and software, such as voice recognition programs and screen enlargement programs, enable people with mobility and vision problems to carry out educational or work-related tasks.
Autism spectrum disorder	Sensory balls, picture boards, sensory toys, visual timers, and social skills videos
Physical disability	Mobility aids such as wheelchairs, scooters, walkers, canes, crutches, prosthetic devices, and orthotic devices

Large print book



Brailed books

JAWS screen reader

Hearing loop

Sound amplifier

Personal amplifier

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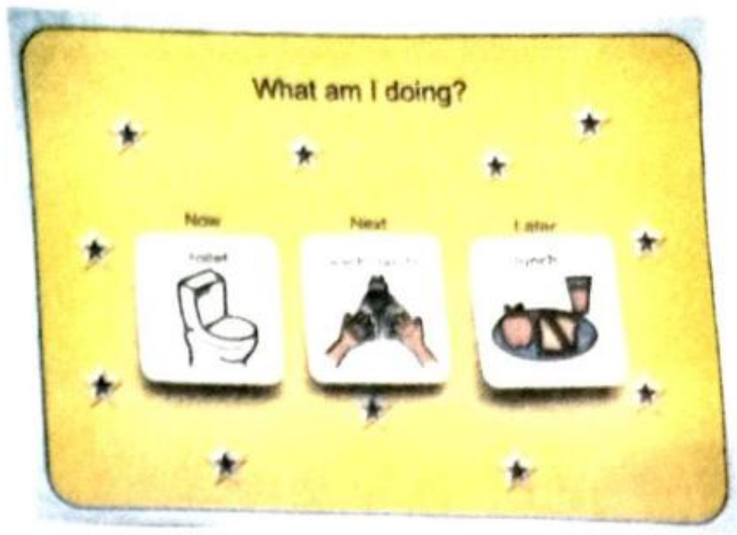
Voice recognition

Prostatic leg



Picture Board

Adaptive technologies

Adaptive technology refers to special versions of already existing technologies or tools that provide enhancements or different ways of interacting with the technology by persons with disability. Adaptation helps individuals with a disability or impairment to accomplish a specific task.

Examples include:

- Large print books
- Digitized text
- Good lighting
- Large monitors
- Software to adjust screen colours
- Computers with voice output
- Computers with visual output
- Electronic mail
- Word prediction software
- Adjustable tables
- Keyboard modifications
- Alternative types of keyboard and mouse
- Accessibility tools built into the popular OS, browsers and software

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discuss technologies that help to impr...
persons with a disability such as adaptive and assistive technologies.

B8.1.2.1.2. Describe how portable computing devices affect our everyday lives

Portable Computing Devices

A portable computer is a computer designed to be easily moved from one place to another and includes a display and keyboard together. It is capable of operating, executing and providing services and applications like a typical computing device. Portable computing devices are also known as Mobile computing devices.

The following table shows the most popular types of Portable Computing Devices.

Types of Portable Computing Devices	Description	Image
Laptop Computer	"A portable computer, usually battery-powered, small enough to rest on the user's lap and having a screen that closes over the keyboard like a lid."(2) Some examples of Laptop Computers are; the Apple MacBook (Pro, Air, or original), the Acer Swift, and the ASUS VivoBook	

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Tablet	"A tablet is a wireless, portable personal computer with a touchscreen interface. The tablet form factor is typically smaller than a notebook computer but larger than a smartphone."(4) Some examples of tablet computers are; the Apple iPad (as shown on the right), the Microsoft Surface, and the Samsung Galaxy Tab.
Smartphone	"A mobile phone that performs many of the functions of a computer, typically having a touchscreen interface, Internet access, and an operating system capable of running downloaded apps."(6) Some examples of Smartphones are; The Apple iPhone X, the Samsung Galaxy Note 8, and the Google Pixel 2.

Portable computing devices affect our lives. There are both positive and negative effects of owning mobile devices that have an impact on our everyday lives. In general, they make life much easier and allow us to use our time more efficiently. With the increase in usage of mobile devices such as smartphones, laptops, smart watches and GPS, access to information and communication has never been more easily accessible. Mobile devices are everywhere and cannot be avoided. With advancements in modern-

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day technology, it seems as if it has taken control of our lives. [illegible] is now done online and having portable computing devices makes our lives much easier. These devices are of utmost importance to everyday life in modern-day world. The table below gives a summary of the positive and negative effects of mobile computing.

Positive and negative effects of portable devices

Portable device	Description	Positive effects on society	Negative effects on society
Smartphone	Mobile phone with touchscreen interface	Internet-accessible, portable, communication, education, digital portfolio	Health risks, addiction, increased stress and anxiety, cyber bullying
laptop	Portable and compact personal computer	Internet-accessible, portable, communication, education, digital portfolio	Expensive, viruses, exposed to inappropriate content, cyber bullying
Smart Watch	Mobile device with a touch screen interface is worn on wrist	Portable, internet accessible, education, business	Expensive, cheating on tests/exams, heavy, addiction, anxiety
GPS	Portable Global Positioning Device	Satellite communication, navigate and know your position	Strangers knowing your location, people tracking your whereabouts

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Group Work

In groups of five (5) (depending on class population), each group should discuss portable computing devices that we use daily, such as mobile phones, smartwatches, etc. and their effect on our daily lives.

B8.1.2.1.3. Explain the issues associated with online services (e.g. social media, wikis, blogs, etc.)

An online service refers to any information and services provided over the Internet. These services not only allow subscribers to communicate with each other, but they also provide unlimited access to information. Online services can range from simple to complex. Examples include social media, wikis and blogs

Social media

The term social media refers to a computer-based technology that facilitates the sharing of ideas, thoughts, and information through virtual networks and communities. Social media is internet-based and gives users quick electronic communication of content, such as personal information, documents, videos, and photos. Users engage with social media via a computer, tablet, or smartphone via web-based software or applications.

Examples of social media include:

- Facebook
- YouTube
- WhatsApp
- Facebook Messenger
- Instagram
- WeChat
- TikTok
- QQ

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Advantages of social media

Social media and technology offer us greater convenience and connectivity:

- staying connected with family and friends worldwide, via email, text, FaceTime, etc.
- quick access to information and research
- banking and bill pay at our fingertips
- online learning, job skills, content discovery (YouTube)
- involvement in civic engagement (fundraising, social awareness, providing a voice)
- great marketing tools
- opportunities for remote employment.

Disadvantages

- **Online vs Reality**. Social media itself is not the problem. It is the way people use it in place of actual communication and in-person socializing. "Friends" on social media may not be friends, and may even be strangers.
- **Increased usage**. More time spent on social media can lead to cyberbullying, social anxiety, depression, and exposure to content that is not age appropriate.
- **Social Media is addicting**. The threat of potential addiction to social media.
- **Fear of Missing Out**. FOMO has become a common theme and often leads to continual checking of social media sites. The idea that you might miss out on something if you are not online can affect your mental health.
- **Self-image issues**. Social media sites provide tools that allow people to earn others' approval for their appearance. This can lead to low self-esteem and the possibility to compare themselves to others.

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Wikis

A wiki (from the Hawaiian wiki to hurry, swift) is a collaborative Web site whose content can be edited by anyone who has access to it. The best example of a wiki in action today is 'Wikipedia – The Free Encyclopedia.

Blogs

A blog (WeBLOG) is a Web site that contains dated entries in reverse chronological order (most recent first) about a particular topic. Functioning as an online journal, blogs can be written by one person or a group of contributors. Entries contain commentary and links to other Web sites, and images, as well as a search facility, may also be included. Because blogs engage people in knowledge sharing, reflection, and debate, they often attract a large and dedicated readership. People who create blogs are called bloggers.

Podcasts

Podcasting is creating content (audio or video–vodcasts) for an audience that wants to listen when they want, where they want, and how they want. Users can listen to podcasts and watch vodcasts on their computer or download portable MP3/MP4 players and listen/watch on the move/ anywhere, which is perfect for busy people.

Issues Associated with Access to Online Services

There are many issues associated with access to online services which will be introduced to you. The three main issues to be explained in depth are the Reliability of Passwords, Identity Theft and Network Security.

Reliability of Passwords

Many people tend to use very easy passwords for many of their accounts because they find simple passwords much easier to remember. What they do not know is that these simple passwords put their computer at risk, and allow hackers to access their financial and personal information.

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Identity Theft

Identity theft can also be known as identity fraud, which is a crime in which an imposter obtains key pieces of personally-identifiable information, such as Social Security or driver's license numbers, to impersonate someone else for financial or legal purposes. Some ways that identity can be stolen are listed below:

- Stealing your mail
- Looking for personal documents in your trash
- Tampering with ATMs or card machines in shops to steal your banking information
- Taking personal information through public sources.

Network Security

Network security is any activity designed to protect the usability and integrity of your network and data. It includes both hardware and software technologies. There are many types of network securities that are available to us such as Access control, Firewalls, and VPNs which most of us are quite familiar with.

Access Control: There is a process called network access control, which allows users to keep out potential attackers. To keep out potential attackers, it is necessary to recognize each user and each device.

Firewalls: Firewalls put up a barrier between your trusted internal network and untrusted outside networks, such as the Internet. A firewall can be hardware, software, or both.

VPN: VPN stands for a virtual private network. A VPN encrypts the connection from an endpoint to a network, often over the Internet.

Group Work

In groups of five (5) (depending on class population), each group should discuss issues that are associated with online service delivery, such as social media, wikis and blogs.

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Summary

- A disability is any condition of the body or mind that makes it more difficult for the person with the condition to do certain activities and interact with the world around them.
- Assistive technology is a technology used by individuals with disabilities to perform functions that might otherwise be difficult or impossible.
- Adaptive technology refers to special versions of already existing technologies that provide enhancements or different ways of interacting with the technology by persons with disability.
- A portable computer is a computer designed to be easily moved from one place to another, and includes a display and keyboard together.
- Social media refers to computer-based technology that facilitates the sharing of ideas, thoughts, and information through virtual networks and communities.

Knowledge-based assessment

1. Technologies that are used by individuals with a disability to perform functions that might be difficult or impossible are called....._

   A. Adoptive technologies. B. Assistive technologies.
   C. Digital technologies. D. Disability technologies.

2. Special version of already existing technologies that enable persons with disability to use them is known as.....

   A. Adoptive technologies. B. Assistive technologies.
   C. Digital technologies. D. Disability technologies.

3. Which of the following assistive technologies is for people with vision impairment?

   A. Audiobooks B. Hearing loop
   C. Tablets D. Task timer

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Picture boards and social ski...

used by.....

A. People with vision impairment.

B. People with Haring impairment.

C. People with autism.

C. People with a physical disability.

5. Mobility aid such as wheelchairs are likely to be used by.....

A. People with vision impairment.

B. People with Haring impairment.

C. People with autism.

C. People with a physical disability.

6. Brailed books and JAWS screen reader are used by.....

A. People with vision impairment.

B. People with Haring impairment.

C. People with autism.

C. People with a physical disability.

7. Sound amplifier and personal amplifier are used by.....

A. People with vision impairment.

B. People with Haring impairment.

C. People with autism.

C. People with a physical disability.

8. Keyboard modifications and large print books are examples of.....

A. Assistive technologies.

B. Adoptive technologies.

C. Technology for people with hearing impairment.

D. Technology for physically challenged people.

9. Which of the following is not an example of a portable computer?

A. Tablet

B. Laptop computer

C. Desktop computer

D. Smartphones.

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known as.....

A. social media. B. Networking.

C. Cyberspace. D. E-commerce.

Theory questions

(a) What is disability?

(b) Give *five* types of disability.

(c) What is adaptive technology?

(d) Outline *five* examples of adaptive technology.

(a) What is assistive technology?

(b) State *three* examples of assistive technology, used by people with the following disability:

(i) Vision impairment

(ii) Hearing impairment

(iii) Physical disability

(c) Clearly distinguish between assistive and adaptive technology.

(a) What is a portable computing device?

(b) Give *four* examples of portable computing devices.

(c) State *two* positive and negative effects of the following portable devices on society:

(i) Smartphone

(ii) Laptop

(iii) Smartphone

(a) What is social media?

(b) Give *four* examples of social media.

(c) State *three* advantages of using social media.

(d) State *three* disadvantages of using social media.

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Health and Safety in the Use of ICT Tools

SUB-STRAND 1.3

Content standards

B8.2.1.3.1 Demonstrate how to apply health and safety measures in using ICT Tools.

Indicators

B8.1.3.1.1 Discuss health issues at workstations.

B8.1.3.1.2 Discuss safety measures in risk reduction at workstations

Introduction

Many people use computer workstations for their work and daily activities. Improper use of such workstations can lead to serious health issues. In this lesson, we are going to learn about the importance of taking breaks from bulk work when using workstations. We will also learn about the correct sitting posture for workstations and other safety measures used to reduce the health risks associated with workstations. Additionally, we will learn about the importance of using ergonomic equipment such as a keyboard, chair, desk, document holder and screen protectors to reduce health risks associated with workstations.

Teaching strategy

A discussion method of teaching is recommended for this lesson. Guide learners to discuss health issues associated with the use of workstations. Let learners discuss the importance of taking regular breaks and proper sitting posture when using a workstation. Assist learners to discuss safety measures in reducing the risk associated with workstations. This includes the use of paper holders, screen protectors, spectacles and adjustable chairs. Guide learners to talk about the importance of using appropriate volume when using speakers and avoiding overloading the electronic socket.

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Content link

At this level, we are going to learn about health issues associated with workstations and the measures that can be used to reduce them. In Basic 9, we will continue this discussion and learn how to evaluate health issues and safety-risk reduction issues at workstations.

Keywords

- Workstation
- ergonomics
- Screen protectors
- Body posture
- Adjustable chair
- workstation stretches
- Document holder

B8.1.3.1.1 Discuss health issues at workstations

Computers are used in all aspects of our lives, such as business, leisure, health and education. The number of computer users keeps increasing every day. Because of this, there has been an increase in the frequency of computer workstation-use-related injuries and illnesses. The healthy relationship between people and their work environment is known as ergonomics. Ergonomics should be considered when setting up a workstations.

Correct workstation setup

A workstation is a place where work of a particular nature is carried out. A safe workstation set-up is setting up of a workstation in such a way as to prevent injuries from prolonged work and overuse of arms, neck, hands and back.

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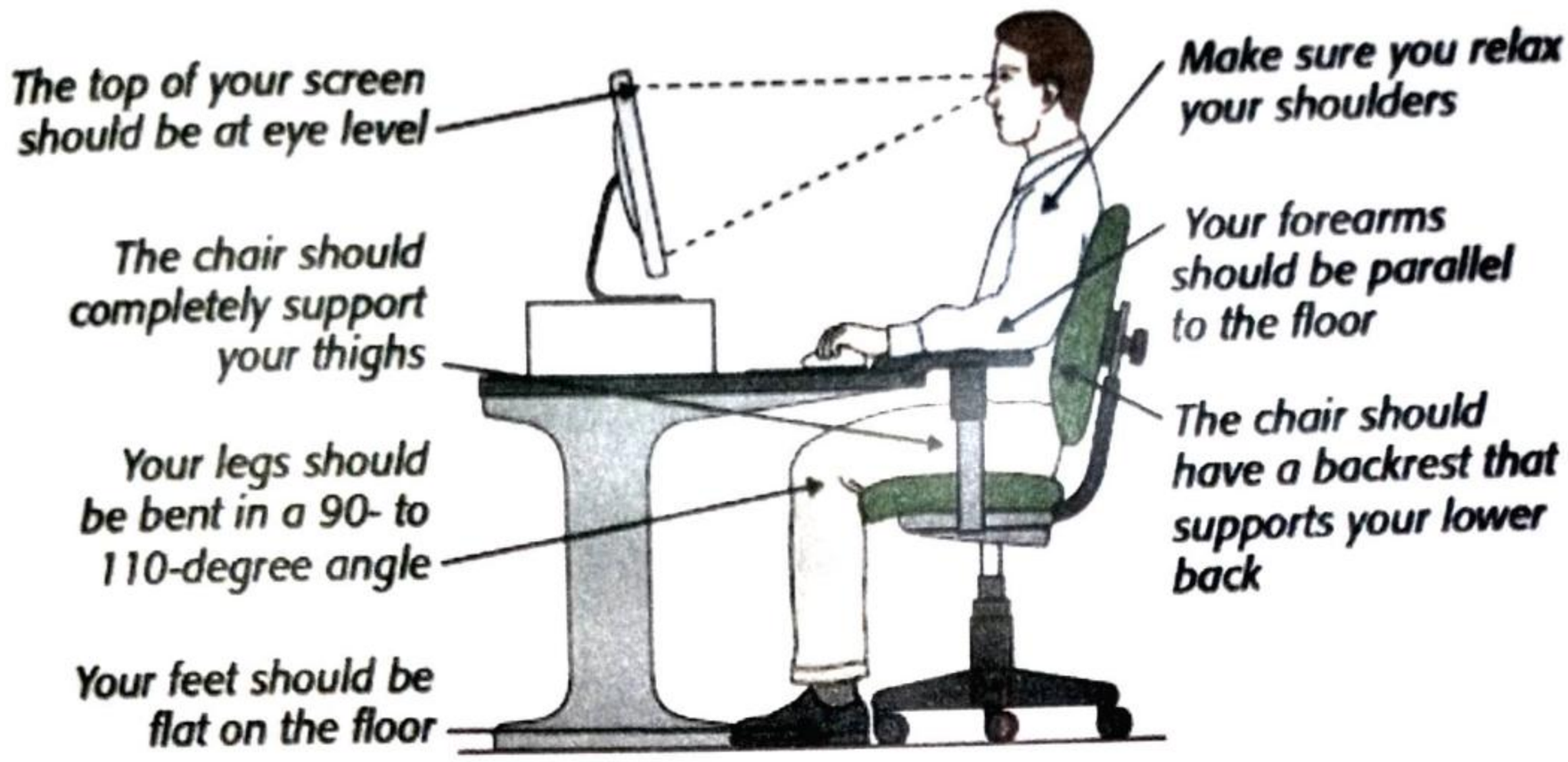
Proper Body Position

Proper posture can avoid discomfort and injury.



1. Set your body to straighten and be comfortable.
2. Place both feet on the floor.
3. Tilt your elbows at a right angle.
4. There should be a 40-70 cm distance between a computer screen and your eyes.
5. Your head should be in front of the computer screen.
6. Your wrist should be on the level of the keyboard so that you can move your fingers easily. Fingers should not be lifted too much from the keyboard.
7. Your fingers should always be on home keys such as ASDF, and LKJ.
8. Focus your eyes on the screen while typing or on the page if you are typing by looking at it.

Take Regular Breaks.

Have a reasonable break while typing, which means don't type continuously for a longer time. It is advisable to type for 30 minutes and give yourself a break for 5 minutes so that you do not feel tired. Stand up, and stretch. If you grab a glass of water on your break, you get bonus healthy points for keeping yourself hydrated as well.

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Stretching out your arms

Triceps stretches

1. Raise your arm and bend it so that your hand reaches toward the opposite side.
2. Use your other hand and pull the elbow toward your head.
3. Hold for 10 to 30 seconds.
4. Repeat on the other side.

Overhead stretch

1. Extend each arm overhead.
2. Reach the opposite side.
3. Hold for 10 to 30 seconds.
4. Repeat on the other side.

Upper body and arm stretch

1. Clasp hands together above the head with palms facing outward.
2. Push your arms up, stretching upward.
3. Hold the pose for 10 to 30 seconds.

Stretching out your torso

Shoulder, or pectoralis stretch

1. Clasp your hands behind your back.
2. Push the chest outward, and raise the chin.
3. Hold the pose for 10 to 30 seconds.

Forward stretch

This stretch is also known as the rhomboid upper or upper back stretch.

1. Clasp your hands in front of you and lower your head in line with your arms.

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2. Press forward and hold for 10 to 30 seconds.

Torso stretch, or trunk rotation

1. Keep your feet firmly on the ground, facing forward.
2. Twist your upper body in the direction of the arm that is resting on the back of your chair.
3. Hold the pose for 10 to 30 seconds.
4. Repeat on the other side.

Tip: Exhale as you lean into the stretch for a greater range of motion.

Stretching out your legs and knees

Hip and knee flexion stretch

1. Hug one knee at a time, pulling it toward your chest.
2. Hold the pose for 10 to 30 seconds.
3. Alternate.

Hamstrings stretch

1. Remaining seated, extend one leg outward.
2. Reach toward your toes.
3. Hold for 10 to 30 seconds.
4. Repeat on the other side.

Be sure to do this one leg at a time, as doing this exercise with both legs out can cause back issues.

Head and shoulder stretches

Shoulder shrug

1. Raise both shoulders at once up toward the ears.
2. Drop them and repeat them 10 times in each direction.

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Neck stretches

1. Relax and lean your head forward.
2. Slowly roll toward one side and hold for 10 seconds.
3. Repeat on the other side.
4. Relax again and lift your chin back to starting position.
5. Do this three times for each direction.

Upper trap stretch

1. Gently pull your head toward each shoulder until a light stretch is felt.
2. Hold the pose for 10 to 15 seconds.
3. Alternate once on each side.

Ergonomic Equipment

There is a wide variety of ergonomically-designed equipment available, including chairs, adjustable-height or sit-stand desks, monitor raisers or arms, alternative mouse devices, keyboards, document holders, reading slopes, footrests, headsets, keyboard sleeves and anti-fatigue mats that can be used to reduce the risk of injury associated with workstations.

Chairs

Chairs used for sitting at workstations should be selected to ensure that the user is appropriately supported. Chairs should be fully adjustable to accommodate different size workers.

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Desks

Workstations desk should be designed so that workers can carry out their work in a comfortable, upright position with shoulders relaxed and upper arms close to the body.

Document Holders

Consider using a document holder/stand if you read from documents whilst typing. The document holder should be located either in line with the keyboard or to the side of the monitor.

Group Work

In groups of five (5) (depending on class population), each group should discuss the importance of taking regular breaks from bulk work, the adoption of good posture while at the computer and the use of document holders.

B8.1.3.1.2 Discuss safety measures in risk reduction at workstations

Listening to sounds at high volume can affect our hearing ability and even make us deaf over the long term. Health hazards associated with the loud volume include:

- hearing impairment due to loud volume of sound.
- noise pollution.

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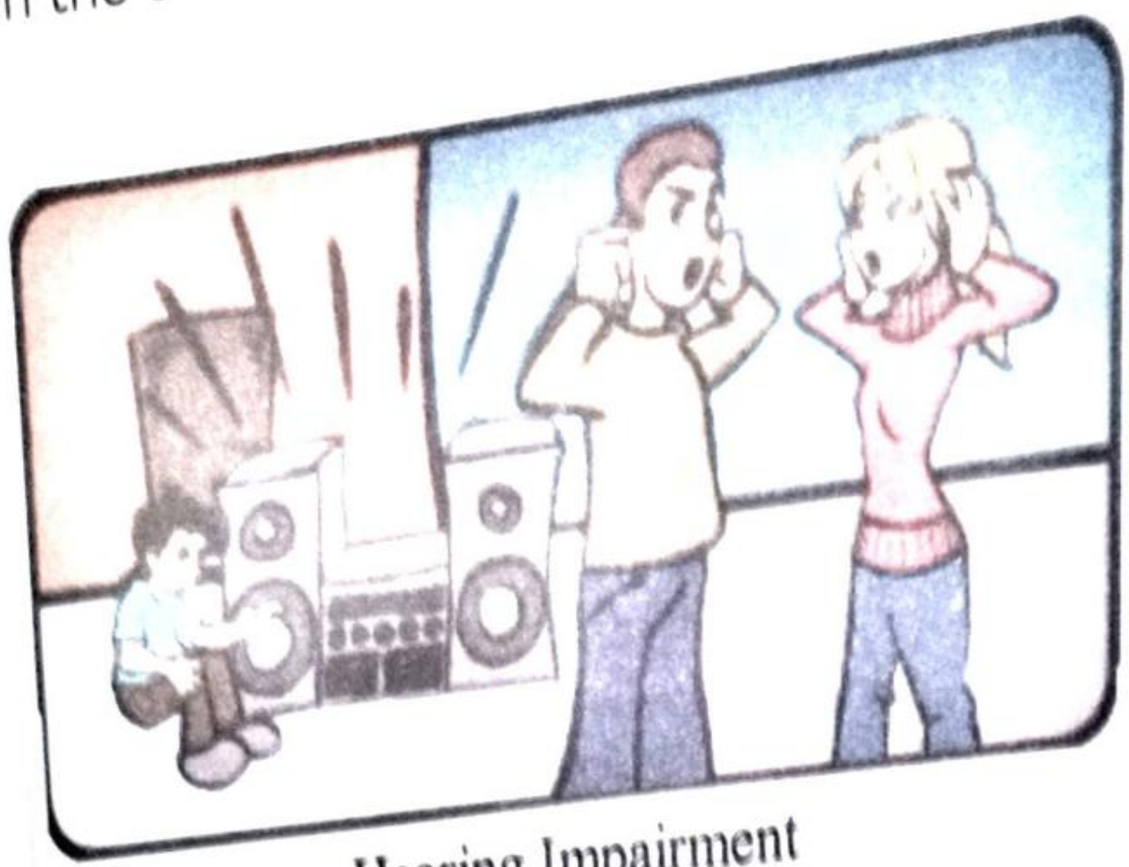

Hearing Impairment

Use appropriate volumes when using speakers and earpieces.

Importance of using screen protectors/spectacles when using a workstation.

Prolonged use of computer screens, tablets, e-readers and cell phones can result in a group of eye and vision-related problems. Many people experience eye discomfort and vision problems when viewing digital screens for extended periods. The level of discomfort appears to increase with the amount of digital screen use. This may be caused by:

- Poor lighting.
- Glare on a digital screen.
- Improper viewing distances.
- Poor seating posture.
- Uncorrected vision problems.
- A combination of these factors.

To prevent the eye problems, one can use a screen protector or spectacles and keep a proper viewing distance when using the computer.

Dangers of overloading the electric socket

It can be very tempting to utilize multiple adaptors, sometimes linking one adaptor to another adaptor on the same socket. Overloading electric sockets puts yourself and your colleagues at risk of electrical harm. You should always avoid overloading the electric socket. Overloading an electric socket increase the risk of causing it to overheat, which in turn could cause a fire. To avoid socket overheating, refrain from plugging in an extension lead into another extension lead.

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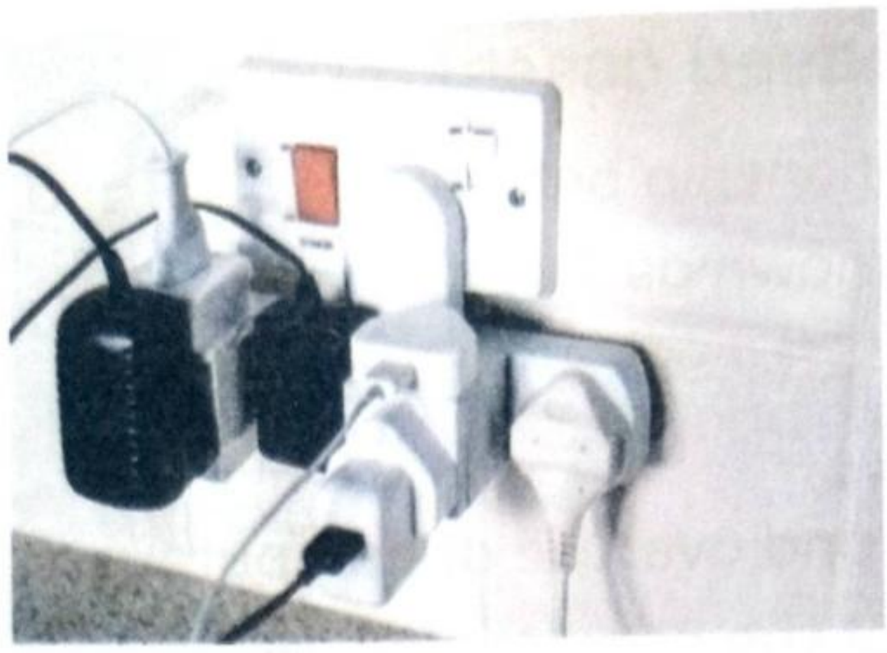

Group Work

groups of five (5) (depending on class population), each group should iscuss the use of appropriate volumes when using speakers and arpieces. Each group should illustrate how not to overload electric ockets.

Summary

Ergonomics is the healthy relationship between people and their work environment.

A workstation is a place where work of a particular nature is carried out.

A safe workstation set-up is setting up of a workstation in such a way as to prevent injuries from prolonged work and overuse of arms, neck, hands and back.

It is advisable to type for 30 minutes and give yourself a break for 5 minutes, stand up and stretch so that you do not feel tired.

Workstation stretches include arms, legs, back, neck, shoulder, head and torso stretching.

Listening to sounds at high volume can affect our hearing ability and even make us deaf over the long term

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Knowledge-based assessment

1. The healthy relationship between people and their work environment is known as.....
   A. Safety B. Ethics C. Ergonomics D. Security

2. Prolonged work and overuse of computers causes injuries to all the following parts of the body except.....
   A. Arms B. Neck C. Back D. Hair

3. Which of the following is the correct posture for the feet when using a workstation?
   A. Your feet should be hanging
   B. Your feet should be crossed
   C. Your feet should be on the table
   D. Your feet should be flat on the floor.

4. Which of the following is the correct distance between the eye and the computer screen?
   A. 5-10 cm B. 11-20 cm C. 20-30 cm D. 40-70 cm

5. For correct sitting posture, the top of the computer screen should be.....
   A. below the eye level B. above the eye level
   C. close to the eye level C. at eye level.

6. When using a work station, your shoulders should be.....
   A. relaxed B. Tilted forward
   C. Tilted backwards D. Hanging

7. To avoid leg injury, your legs should be bent at.....
   A. 90 to 110 degrees B. 60 to 70 degrees
   C. 180 degrees D. 270 Degrees

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8. A suitable chair for a workstation should be.....
   A. adjustable with back support.
   B. adjustable without back support.
   C. fixed with no back support.
   D. very large and comfortable with no back support.

9. After how many minutes should you take a break when using a workstation?
   A. 20 minutes B. 30 minutes C. 40 minutes D. 50 minutes

10. All the following are arm stretches except.....
    A. shoulder shrug B. triceps stretches
    C. overhead reach D. upper body stretch

T Theory questions

1. (a) What is a workstation?
   (b) Explain the characteristics of a correct workstation setup.
   (c) With the aid of a diagram, briefly explain proper body position when using a workstation.
   (d) It is important to take regular breaks when using a computer. Briefly **explain** how you will stretch the following parts of your body:
   (i) Arms (ii) Torso
   (iii) Legs and knees (iv) Head and shoulder

2. (a) Explain why it is important to use a document holder when typing.
   (b) Why is it important to use screen protectors when using a workstation?
   (c) State *two* effects of high sound volume.
   (d) Explain the danger of overloading the electric socket.

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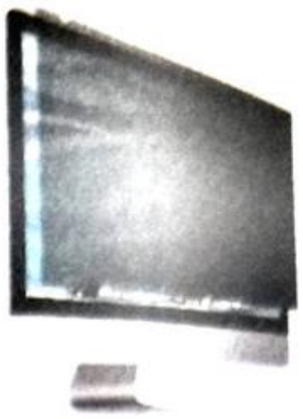
Practical Test

1. (a) Name the following devices.

I

II

III

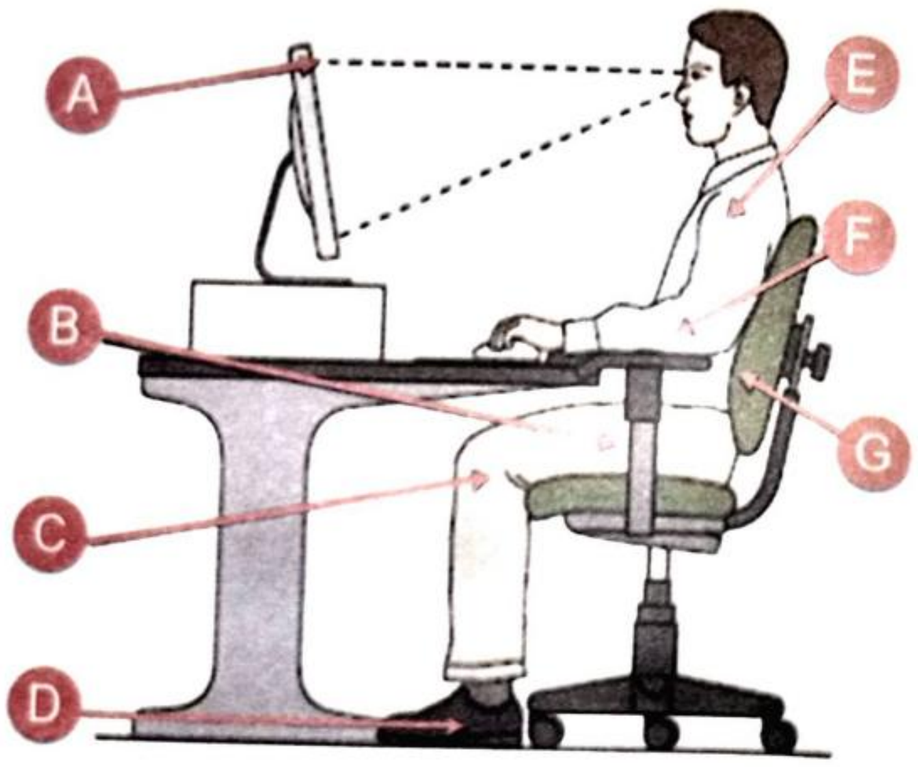


IV

(b) What is the use of each device in 1 (a) above?

(c) Explain how each of the devices above can be used to prevent injuries associated with workstation.

2. The picture below is the correct workstation setup. Use it to answer the questions that follow.



(a) State the correct adjustment for each of the parts labelled A to G to prevent workstation injury.

(b) List two exercises that can be used to prevent injury to the following parts of the body:

(i) Neck (ii) Back

(iii) Wrist (iv) Eyes

(v) Legs

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STRAND 2 PRODUCTIVITY SOFTWARE

- Sub-Strand 2.1: Introduction to Word Processing
- Sub-Strand 2.2: Introduction to Presentation
- Sub-Strand 2.3: Introduction to Desktop Publishing
- Sub-Strand 2.4: Introduction to Electronic Spreadsheet

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