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# SCIENCE & COMPUTER

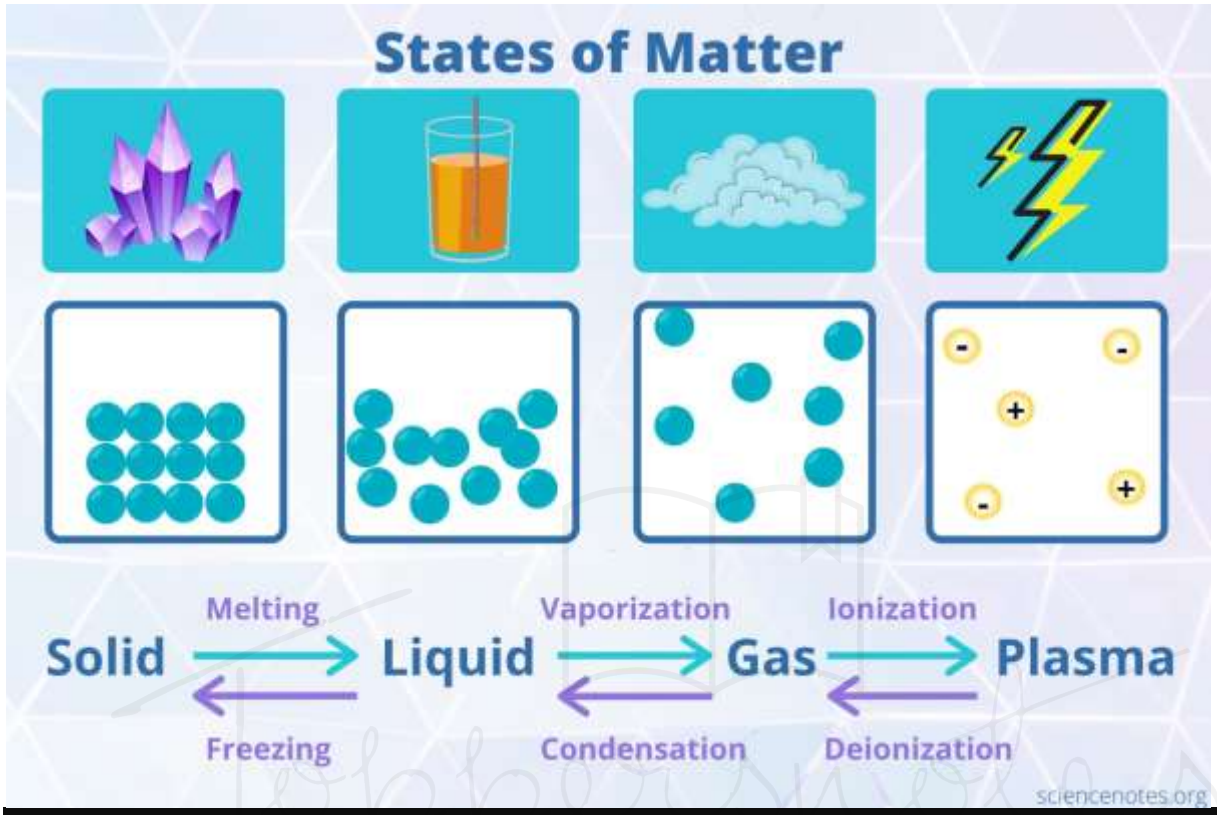
**For All Competitive Exams**

SIERRA INNOVATIONS

# Index

# 1 CHAPTER Chemistry

## States of Matter




## Solids

- Matters which have **fixed volume** and **shape**.
- **Eg** - stone, wood, brick, ice, sugar, salt, coal, etc.
- **All metals** are solid **except mercury** and **gallium**.

### Properties of solids

- Fixed volume.
- Fixed shape.
- High density.
- Heavy.
- Do not flow.

## Liquids

- Matters which have **fixed volume** but **indefinite shape**.
- **Eg** - milk, water, petrol, kerosene, alcohol, oil, etc.
- Since **liquid** can **flow**, it is also called **fluid**.

### Properties of liquids

- Definite volume.
- No definite shape.
- Get the shape of container in which they are kept.

- Cannot be compressed much.
- Have less density compare to solid.
- Lighter than solid.
- Liquids flow and hence are called fluids.

## Gas

- Matters which have **indefinite shape** and **volume**.
- **Eg** - air, oxygen, hydrogen, nitrogen, carbon-dioxide, etc.

### Properties of gases

- Indefinite shape
- No fixed volume.
- Get the shape and volume of container.
- Fill the container completely.
- Have very low density.
  - So, gases are light.
- Can flow easily and hence are called fluids.

| Properties | Solids | Liquids | Gases |
|---|---|---|---|
| Shape | Definite shape | Do not have a definite shape, will take the shape of the container | No definite shape |
| Volume | Definite volume. As intermolecular forces between the constituent particles are strong | Definite volume. As intermolecular forces between the constituent particles are strong | No definite volume As intermolecular forces between the constituent particles are weak |
| Compressibility | Negligible | Negligible | High |
| Diffusion | Can diffuse into liquids | Diffusion is higher than solids | Highly diffusible as particles move randomly at high speed |
| Fluidity or rigidity | Very rigid and cannot flow from one place to another | Less rigid and are capable of flowing from higher to lower levels | No rigidity and can flow most easily among the three states of matter. They usually flow from high pressure to low pressure areas |

## Cause of different physical states of matters

The physical states of matter depend upon three main factors:

- The **force of attraction** between particles.
- The **space** between the **particles**.
- The **kinetic energy** of particles.

### Solids

- The **force of attraction** between the particles of solids is **very strong**.
- There are **minimum spaces** between the particles of solids.
- The particles of solids have **minimum kinetic energy**.
- Because of great force of attraction **particles** of solids are **closely packed** together.
  - This makes the **space** between particles of solids **almost negligible.**
- The **lowest kinetic energy** of particles is **not able to move the particles** of solids.
- Hence, the great force of attraction and least space between particles of solids and lowest kinetic energy of particles **keep the particles** at **fixed places**.
- Because of the combination of these characters **matter** exists in **solid state**.

### Liquids

- The **force of attraction** between particles is strong but **less strong than solids.**
- The **space** between particles is **more than** that of **solids** but not less than liquids.
- The **kinetic energy** of particles is **greater** than **solid**.
- **Strong force of attraction** keeps the particles of **liquids packed** together.
  - But the **force** of attraction between particles of liquids is **less strong** than that of solid.
  - Because of this particles of **liquids** are **loosely packed** compared to solid.
- The **kinetic energy** of **particles** of **liquids** is **greater** than that of **solids**.
- Because of more space between **particles** and more **kinetic energy than solids** the particles of liquids slide over one another.
- These characters make a matter to exist in liquid state.
- **Liquid** can **flow** because its particles can slide over one another.

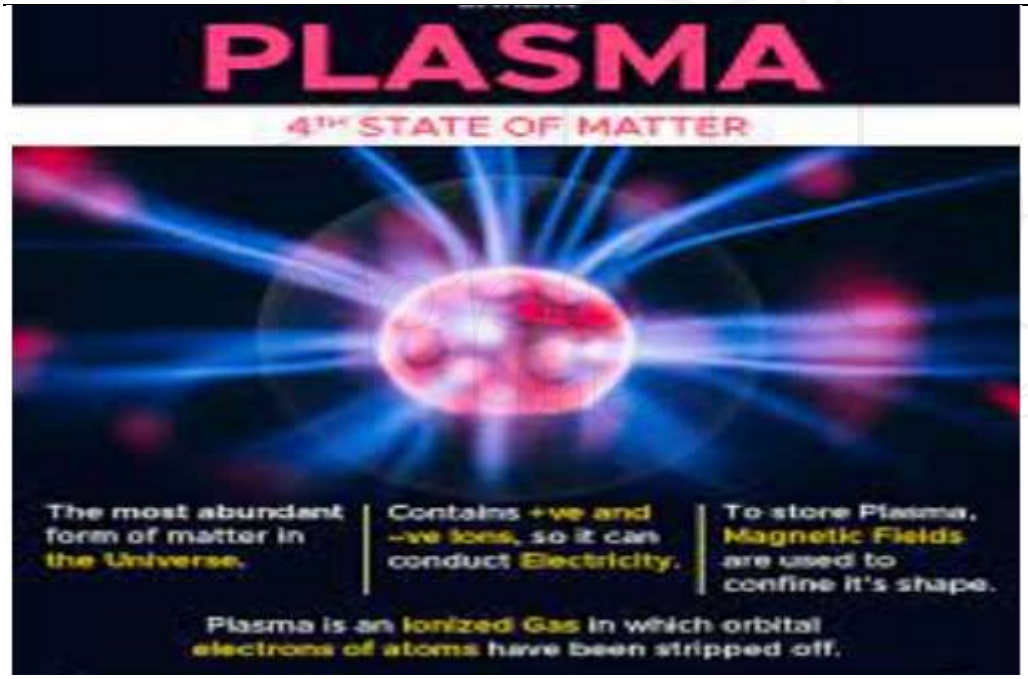
### Gases

- The **force of attraction** between particles of gas is almost **negligible**.
- The **space** between particles of solid is **greatest**.
- The particles of gases have the **greatest kinetic energy**.
  - Because of negligible force of attraction the **particles of gases** are **loosely packed** consequently there are lots of spaces between their particles.
  - Because of the **greatest kinetic energy** the particles of **gas move** with **high speed.**
- Because of **negligible** force of **attraction** between **particles** and greatest kinetic energy the particles of gas have a tendency to escape out.
  - Because of these characteristics a matter exists in gaseous state.

- A **matter** exists in **solid** state because of the **greatest** force of **attraction** between its **particles** which makes the **particles closely packed**.
- A matter exists in **liquid** state because of **less force of attraction** between its particles than a solid, which makes the **particles** closely packed but allow them to **slide** over one another.
- A matter exists in **gaseous** state because of an almost **negligible force of attraction** between its particles, which is unable to keep the particles bonded together.

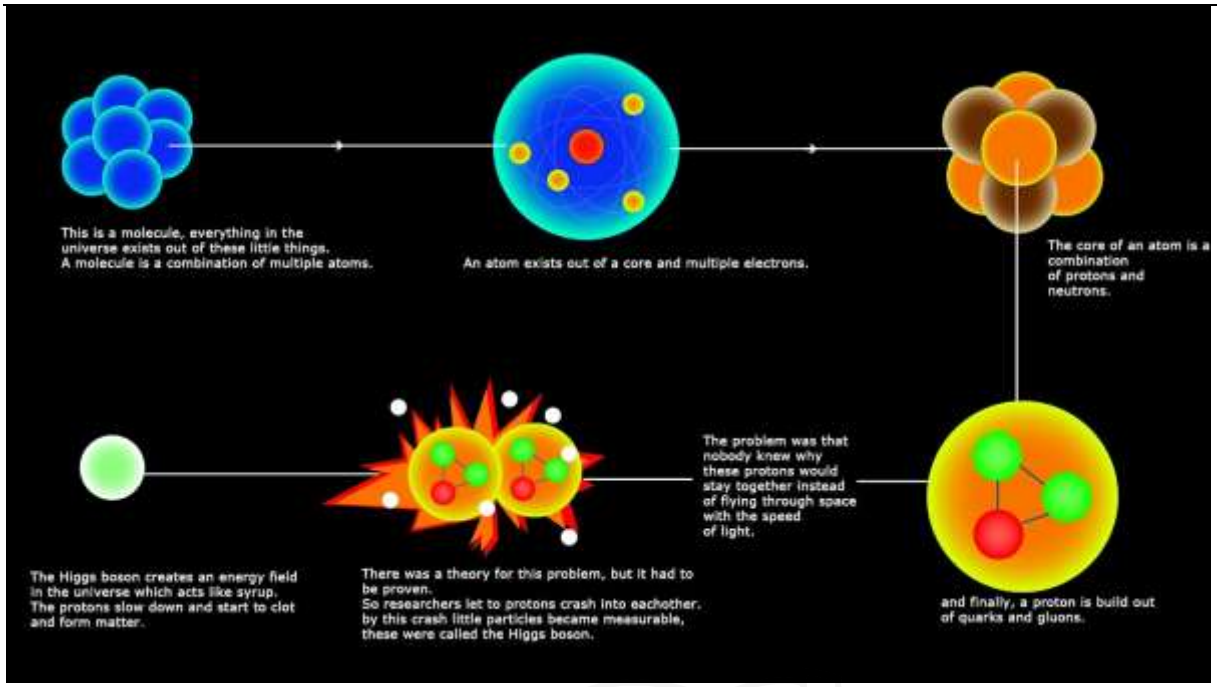
## Other states of matter

### Plasma




- **Fourth state** of matter.
- **Similar** to **gas**.
- Particles of plasma are made of **free electrons** and **ions**.
- Do **not** have a **definite shape** or a **definite volume** unless enclosed in a container.
- Defined as **electrically neutral** medium of **positive** and **negative particles**.
- Plasma is one of the **most commonly occurring states** of matter in universe.
- Plasma **occurs naturally** in the **stars**.
- All **stars** are made of **plasma**.
  - Because of the **presence of plasma stars glow**.
- Plasma is formed because of **nuclear fusion** in **stars**.
  - Our **sun glows** because of presence of plasma.
  - **Plasma TV** got its name because of presence of plasma in it.
  - Plasma is also found in **fluorescent light** or **neon sign**.
  - Plasma is formed when **electricity** is **passed** in a **fluorescent** tube or **neon sign**, which makes them glow.

### Bose-Einstein Condensate (BEC)




- **Fifth state** of matter.
- **Satyendra Nath Bose** and **Albert Einstein** were predicted about this state of matters, that's why it got its name as **Bose-Einstein Condensate (BEC).**
- Plasma and BEC are has **opposite** characters.
  - Plasma is a **super hot** and **super excited atom**
  - Condensate has **super cool** and **super unexcited atoms**.
- BEC was obtained by **cooling the vapour of rubidium-87** at super **low temperature** by Eric Cornell and Carl Wieman on June 5 1995.
- After sometimes Wolfgang Ketterle also obtained BEC from **sodium-23** at MIT, USA.
- Cornell, Wieman and Ketterle got **Nobel Prize** in Physics for this achievement in 2001.

## Atomic Structure

### Fundamental Constituents of an Atom

- An atom contains **three basic particles** namely protons, neutrons and electrons.
- The **nucleus** of the atom contains **protons** and **neutrons**.
  - **Protons** are **positively charged**.
  - **Neutrons** are **neutral**.
- The **electrons** are located at the **outermost regions** called the **electron shell**.

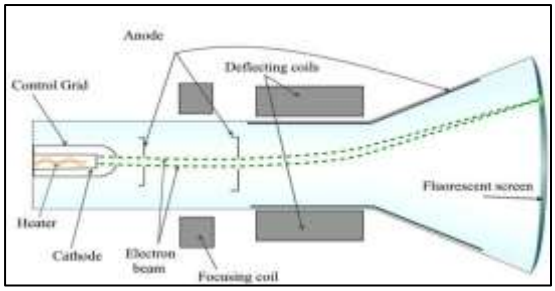

## Electron

- **J. J. Thomson**, in **1897**, discovered **negatively charged particles** emitted by the **cathode** towards the anode in a cathode ray experiment.
- These **negatively** charged particles are **Electrons**.

### Cathode ray experiment

- **J. J. Thomson** discovered the **existence** of **electrons**.
- He did this using a cathode ray tube, which is a **vacuum-sealed tube** with a **cathode** and **anode** on one end that created a **beam** of electrons travelling towards the other end of the tube.
- The air inside the **chamber** is subjected to **high voltage** and **electricity** flows through the air from the **negative electrode** to the **positive electrode**.

- The **characteristics** of cathode rays (electrons) **do not depend** upon the **material** of **electrodes** and the **nature** of the **gas** present in the cathode ray tube.
- The experiment showed that the **atom** was **not** a **simple**, **indivisible** particle and contained **at least one subatomic particle** – the electron.




## Protons

- **Ernest Goldstein**, in 1886, discovered that with a different condition in the same chamber, **anode** emitted **positively charged particles** known as **Canal rays** or later named as **Protons**.

## Neutrons

- **J. Chadwick** discovered a subatomic particle with **no charge** and a **mass** equivalent to **protons** in the nucleus of all atoms.
- These **neutrally charged** particles are Neutrons.

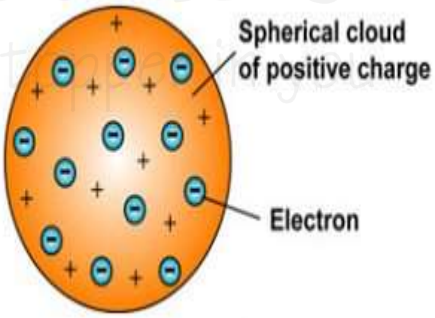
## Properties of electrons, protons, and neutrons

| Property | Electrons | Protons | Neutrons |
|---|---|---|---|
| Charge | Negatively Charged | Positively Charged | No Charge |
| Affinity | Attracts to positively charged | Attracts to negatively charged | Get attracted neither to positive nor negative |
| Weight | Mass is negligible | 1 a.m.u | 1 a.m.u |
| Location | Outside the nucleus | Within the nucleus | Inside the nucleus |

Different Models on Structure of an Atom

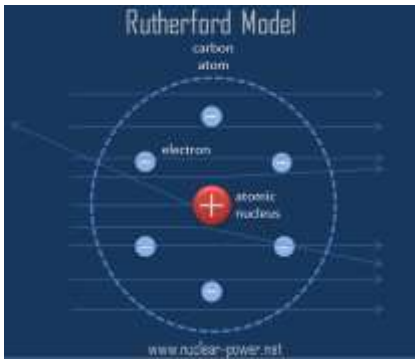
### Thomson's Model of an Atom

- **J. J. Thomson** proposed that the structure of an atom is similar to that of a **Christmas pudding** where electrons are embedded like currants in the sphere.
- He **proposed** that:
  - The **structure** of an **atom** is a **positively charged sphere** that embeds electrons in it
  - An atom is **electrically neutral** as the **protons** and **electrons** are **equal** in magnitude
- **Drawbacks** of Thomson's Model:
  - Thomson's structure of an atom **failed** to **explain** the **arrangement** of **protons** and **electrons** in its structure.




### Rutherford's Model of an Atom

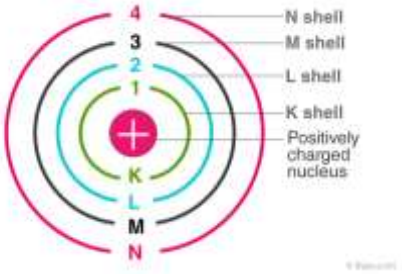
- **Rutherford** conducted an experiment **bombarding** the **alpha (α)-particles** on a **gold foil**.
- He observed the **trajectory** of the **alpha (α)-particles** after passing through an atom and **drafted** some **postulates** of the experiment, which are:
  - **Most** of the **space** in an **atom** is **empty** as the **particles passed** through the **gold foil** without any **hindrance**
  - The **positively charged centre** is called the **Nucleus**, and all the **mass** of an atom **resides** in the **centre**.
    - **The** particles **deflected 180°** after **bombarding** the **nucleus**
  - The **electrons orbit** the centre in a **defined path**
  - The **size** of the **nucleus** is **small** compared to the total size of the atom
- **Drawbacks** of the Model:
  - Although **Rutherford** presented an **entirely new model** regarding the structure of the atom, there were a lot of drawbacks which he failed to explain, are-
    - The **electrons revolve** in an **unstable path**, and they undergo **acceleration radiating energy**.



- When the **electrons revolve**, they **lose energy**.
- Soon electrons would **collapse** into the **nucleus**.
- This tendency would make an **atom highly unstable** while the **atom** is **highly stable**
- Rutherford's structure of an atom **failed** to **explain** the **atomic number** concept as it explained only the presence of protons in the nucleus

### Bohr's Model of an Atom

- Bohr devised a model in order to **overcome** the **objections** that **Rutherford's model** raised.
- So, he stated the following **postulates**:
  - An atom **permits** only a **discrete** amount of **orbitals** for the **electrons** to **orbit** and make the outer structure of an atom
  - While revolving, the **negatively charged particles** do **not lose energy** in these **orbitals** or **energy levels**
  - When the **electron jumps** from **one energy shell** to **another**, a change in magnitude takes place
- Bohr's model gives an **elaborative explanation** on the structure of an atom and **overcomes** the **objections** faced by all the other models on the structure of an atom**.**




## Distribution of Electrons in Distinct Shells

- Bohr-Bury Scheme **suggested** the **arrangement** of **particles** in **different orbits**.
- The following are the rules to write the number of particles in different orbitals:
  - The formula **2n^2** gives the accommodation of the **maximum number of electrons** in each shell, n=1, 2, 3, 4 for K=2, L=8, M=18, N=32.
  - The **outermost orbit** can hold a **maximum** of **8 electrons.**
  - The electrons fill the inner levels first as they **follow** the **stepwise filling of orbitals**
- **Number of electrons in K-shell:** n = 1
  - 2n^2 = 2 × 1^2 = 2
  - Maximum number of electrons in K-shell, first shell = 2
- **Number of electrons in L-shell, n** = 2,
  - 2n^2 = 2 × 2^2 = 8
  - Maximum number of electrons in L-shell, Second shell = 8
- Using the **formula 2n^2** number of **electrons** in any shell can be **calculated**.

## Valency

- **Valence Electrons** - The negatively charged particles present in the outermost shell.
  - These valence electrons are **responsible** for the **valency** of an atom.
- **Valency** - tendency of an atom to react with the other atoms of the same or various elements.
  - The atoms that fill the **outermost paths** show **chemical activity** towards other valence electrons.
  - This reactivity is **responsible** for the **formation** of **molecules** between two or more atoms.
- The valency **becomes zero** for an **atom** when the **outer bounds** have **eight electrons** or **no electrons** to lose.
- The particle with **eight electrons** in the **outermost shell** is an octet, and these molecules are **mostly inert** in nature.
- **Eg**:
  - **Magnesium** (Mg) has a configuration (2, 8, and 2), so the valency is two.
  - **Oxygen** (O) (2, 8, and 6) has the valency two as the number electrons it can gain is two to achieve a packed outer energy level.
  - **Helium** (He) has 2 electrons in its outer shell, Neon (Ne) (2, 8, and 8) has eight electrons in its outer shell.
    - Hence, they do not show any chemical activity.

## Atomic Number (Z)

- Atomic number = **number of protons** present in one atom of an element.
- As the atom is **electrically neutral**, the number of **protons** and **electrons** are the same.
- The notation **Z** denotes an **Atomic number**.
- The atomic number of Hydrogen is one as it has **only one proton.**
  - **Number of Protons** present in an atom = Atomic number (Z)
  - **Number of Electrons** present in an atom= Atomic number (Z)
  - **Number of Neutrons** = Mass number (A)- Atomic number (Z)

# 10 CHAPTER Introduction to Computer

- Computer is a fast Working electronic machine, which accepts the input information and data in electronic form and processes it according to pre-stored instructions, provides desired output.
- It is also called computer in Hindi.
- The word 'computer' is derived from the word 'compute', which means 'to calculate'.
- Abacus - In ancient times, the device that taught counting was called Abacus.
- John Napier developed the logarithm.

**Machine Development**

- The Pascal calculator was the first machine calculator, invented by Blaise Pascal (Mathematician from France).
- **ENIAC -** Electronic Numerical Integrator and Computer) It is also called the first digital computer.
- Charles Babbage is called the creator or father of the modern computer.

## Generations of Computers

### First Generation (1942-55)

- In this vacuum tubes or vacuum valves were

**Used.**

- The first stored program computer was developed by Morris Wilkies (England) in the form of EdSec.

| Generations | Hardware/Technology | Memory Device | Programming Language | Examples |
|---|---|---|---|---|
| I (1942-55) | Vacuum Tube | Magnetic Disks, Input, Output Pentacards | Machine Language/ Binary Language | ENIAC, UNIVAC |
| II (1955-64) | Transistor | Magnetic Core, Magnetic Tape | Assembly Language, High Level Language (COBOL & FORTRAN) | IBM – 2000 CDC – 360 |
| III (1965-70) | IC (Integrated Circuit) | Magnetic Core (Floppy Disk) | Compiler Language (1972-'C' Language) | IBM – 320 |
| IV (1971-85) | VLSI – Very Large Scale Integration SSI – Small Scale Integration LSI – Large Scale | CD (Compact Disk) | IV Generation Language | IMAC (Siddarth) |

| | | | | |
|---|---|---|---|---|
| | Integration<br>Micro prossessor, Use of Micro Computer | | | |
| V<br>(1985, till now) | ULSI<br>(Ultra Large Scale Integration<br>(Artificial intelligence) | DVD/PD/Memory Card / BRD | Natural Language | Laptop/ Tablet |

## Second Generation (1955-64)

- In 1947, William "Cockley" of Bell Laboratory (USA) developed 'Transistor' (PNP or NPN semiconductor device).
- In this generation computers, input and output devices were more convenient.
- To avoid the complexity of the first generation developed machine and assembly language, simple computer language i.e. high level language was developed in the second generation.
- Computers became smaller and cheaper in size with the use of transistors instead of vacuum tubes.
- Computer languages like FORTRAN, COBOL etc. developed.

## Third Generation (1965-70)

- Developments in electronic technology made it possible to make a small silicon chip.
- This new technology is called Integrated Circuit or Integrated Circuit.
- With this generation of computers, external devices for storing data such as discs, tapes, etc. were developed.
- ICL 2903, ICL 1900, UNIVAC 1108 and System 1360 were prominent among the computers of this generation.

## Fourth Generation (1971-1985)

- ICs were further developed in this generation, which are called massive integrated circuits.
- With this invention, the entire central processing unit came in a small chip, which is called a microprocessor.
- ALTAIR 8800 was the first microcomputer, which was made by a company called MITS.
- With the arrival of the fourth generation, the size of the computer became very small and the memory increased a lot.

## Fifth Generation (1985, till now)

- In this the use of Ultra Large Scale IC (ULSIC) started, in which circuits equivalent to millions of transistors were made on a small chip.
- ULSIC (Ultra Large Scale Integrated Circuit) was created by upgrading the VLSIC chip in the internal electronic circuit of the computer, due to which the size of the microcomputer is getting smaller day by day.
- Today computers are available in different models desktop, laptop, palmtop etc.

- Internet, multimedia developed in this generation.
- Development of new application, artificial intelligence has made great progress in this area.

## Classification of Computer

| Classifications of Computer | |
|---|---|
| **Based on Technology** | **Based on Efficiency and Capacity** |
| (i) Digital Computer | (i) Mainframe computer |
| (ii) Analog computer | (ii) Mini computer |
| (iii) Hybrid | (iii) Micro Computer |
| (iv) Optical Computer | (iv) Super computer. |

### Based on Technology

**2. Digital/Numerical Computer**
- In these computers, information and data are represented in a discrete form as a fixed number 0 or 1.
- This computer expresses each action or activity in 'Yes' (i.e., 1) and 'No' (i.e., 0) and acts accordingly.
- Binary digital system is used in digital machines.

**3. Analog Computer**
- Those computers in which various physical quantities such as pressure, temperature, length etc. keep changing continuously.
- These computers measure an amount on the basis of mutual comparison.

**4. Hybrid Computer**
- Both analog and digital computers are used in hybrid computers.
- While calculating, some parts are calculated on analog computer and some on digital computer.

**5. Optical Computer**
- The computing devices in these are made based on the optical method.
- A medium such as a wire is not required for the conduction of light.

### Based on Efficiency and Capacity

**1. Mainframe Computer**
- It was as huge as the size of a room.
- Its specialty was that more than 100 people can work together in this computer.

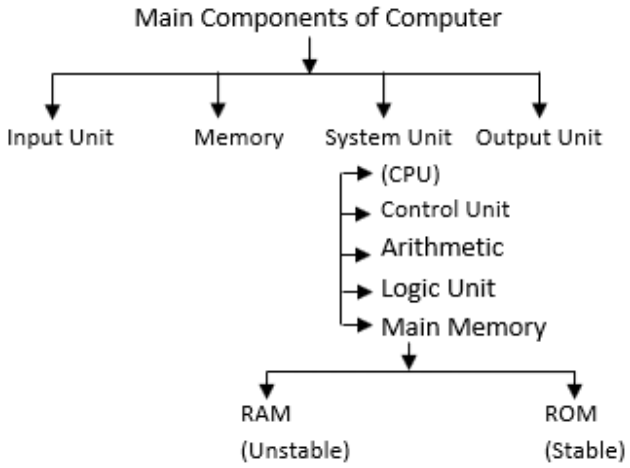
**2. Mini Computer**
- Minicomputers are cheaper, less powerful and of medium size as compared to mainframe computers.
- They are often used in laboratories and commercial organizations.

**3. Micro Computer**
- These are small computers.
- They are cheap in price and small in size, so they can be taken home or outside for personal use, they are also called personal computers or PCs

**4. Super Computer**
- It is very powerful, dynamic and its memory capacity is also very high.
- The working capacity of super computer is more than 500 megaflops.
- They are used in weather forecasting, scientific and space related research, molecular modulating, physical simulation, military agencies, etc.
- Multiple CPUs work in parallel order in a super computer.
- The world's first supercomputer research company had created 'CRAY K.I.S' in the year 1979.

# 11 CHAPTER

# Computer Working System, Input, Output and Storage




1. **Input Unit**
   - It is the unit of the computer that receives input in the form of data and commands.
2. **Storage**
   - This unit is used to store the processed data temporarily and the provided output permanently.

Input Unit → Processing Unit → Output Unit
↓ ↑
(Data + Instruction) Memory Unit (Information)

**Memory can be divided into two parts -**

(i) Primary or Main Memory

(ii) Secondary or Auxiliary Memory

3. **System Unit**
   - Its function is to process the given data and extract information from it in the form of output, it is also called CPU (Central Processing Unit).
   - It is also called the brain or heart of the computer.
   - It is mainly divided into two parts –

**(i) A.L.U (Arithmetic and Logic Unit)**

- All the arithmetic and logical calculations occurring in a computer are done by this unit.
- ALU Contral Unit - Can calculate on any data according to the instructions given by it.
- Logical calculations are meant for addition, subtraction, multiplication, division, etc.

**Note –** AND, OR, NOT etc. are called Boolean operators, which are used to perform logical calculations.

**(ii) CU - Control Unit**

- All types of activities happening in a computer are controlled by this unit.
- The control unit provides a variety of instructions to the ALU to perform calculations.
- The control unit also performs the task of bringing the processed data in the main memory to the processor.

**Storage Unit**

- The word to be processed in the computer is 0 or 1 as a binary digit, is denoted.
- Binary digit 0 or 1 is defined by bit (binary digit) or letter or character.
- A word in a computer is made up of 8 bits, which is called a byte.
- The smallest unit of memory in a computer is a bit (bit).

4 Bit = 1 Nibble

8 Bit = 1 Byte

$2^{10} - 1024\ Byte = 1\ KB\ (Kilo\ byte)$
$= 1000$

$2^{20} - 1024\ KB = 1MB(Mega\ byte)$
$= 1000^2$

$2^{30} - 1024\ MB = 1GB(Giga\ byte)$
$= 1000^3$

$2^{40} - 1024\ GB = 1\ TB\ (Tera\ byte)$
$= 1000^4$

$2^{50} - 1024\ TB = 1\ PB\ (Penta\ byte)$
$= 1000^5$

$2^{60} - 1024\ PB = 1\ EB\ (Exa\ byte)$
$= 1000^6$

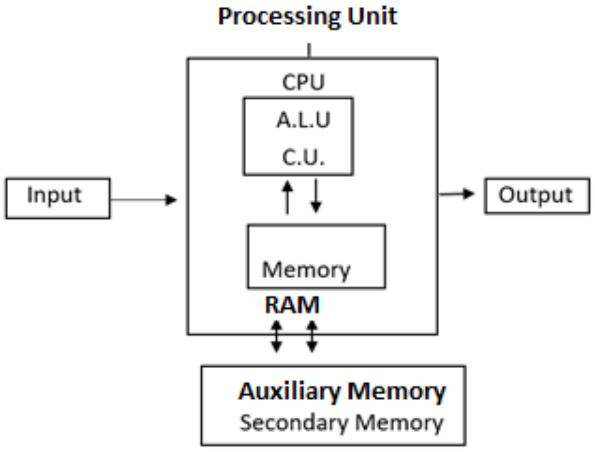
$2^{70} - 1024\ EB = 1ZB\ (Zetta\ byte)$
$= 1000^7$

$2^{80} - 1024\ ZB = 1YB\ (yotta\ byte)$
$= 1000^8$

**Ascending Order** -

Bit < Byte < KGB < MB < GB < TB < EB < ZB < YB

1024 KB $= 2^{23} Bit$
$= 1024 \times 1024 \times 8$
$= 2^{10} \times 2^{10} \times 2^3$
$= 2^{23}$




- Processor has Resistor and System Clock in addition to ALU and CU.

**4. Output Unit**

- The user receives the processed results through the output itself.
- Examples of some output devices are monitors, printers, speakers, pen drives, etc.

## Input and Output Devices

### Input Device

- Input devices are used to input data, instructions, information etc. into the computer.
- Input devices also work to encode data, with the help of which the data can be processed in the computer.

  **Note -** The data going into the computer is called input.

Input $\xrightarrow{\text{Encoder}}$ Binary /Machine Language $\xrightarrow{\text{Decoder}}$ Output (Information)

(Data + Instruction) [11000000] 0 or1 (11000000)

(Processor)

**Input devices are:-**

**1. Key Board (101 – 108) / QWERTY**

- These are the most popular input devices for inputting into the computer.
- With the help of key-board, data and instructions can be entered in the computer.
- Keyboard is an input device based on typewriter.
- Keyboard is a device acting like an encoder, which works to convert the input data into 0 or 1 binary digit.
- By pressing and holding a key on the keyboard for 0.5 seconds, the letter of the key is input evenly, this process is called typomatic.
- **Different types of keys -**

**(i)** Numeric Keys (0 से 9) = To input the numbers.

**(ii)** Alpha Keys (A से Z) = To input the alphabets.

**(iii)** Function Keys [$F_1$ से $F_{12}$] = Total = 12

$F_1$ = Help

$F_2$ = Rename

$F_3$ = Search

$F_4$ = Redo

$F_5$ = Refresh/Slide Show

$F_6$ = To move the cursor to the address bar in an Internet browser.

$F_7$ = For grammar and spelling errors.

$F_{12}$ = Save as

**(iv)** Toggle Key – The key having (On) and Off (Off) features in the keyboard is called (Toggle Key).

(a) Num Lock – This key is used to use the arrow key present on the numeric pad.

(b) Caps Lock – This key is used to input capital letters.

(c) Scroll Lock – With the help of this key, moving forward and backward in the document is stopped at a particular place.

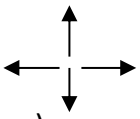
**(v) Modifier Key/Combination Key -**

(a) Alt (Alter)- 2

(b) Ctrl (Control) -2

(c) Shift (Shift) – 2

**(vi)** Navigation Key



(a) Arrow Key

(b) Page up (To go to the first page)

(c) Page down (To go to the next page)

(d) Home (To go to the first page of the document)

(e) End (To go to the last page of the document)

**(vii)** Special Character Key –[* # & $]

**(viii)** Special Key

(a) Space bar – To leave space between the two words.

(b) Tab Key – Pressing the Tab key in MS Word moves the cursor forward 0.5 inches.

(c) Back Space – It is used to erase the letter from the left side.

(d) Delete – To erase the letter from the right side is used.

(e) Enter – With the help of this key, a new line or a new paragraph is started in a document.

(f) Window – Pressing it activates the start button.

**Numeric Keypad Key-Board**

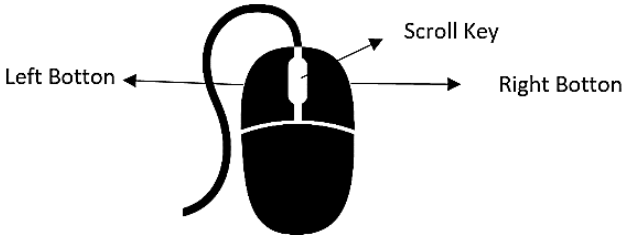
- This is a set of 17 keys on the right side of the keyboard.
- The second row of the key board is called ASDFGHJKL Home Key.

**2. Pointing Device**

- That input device in which a pointer, called a cursor, is used to provide data and instructions.

**(i) Mouse-**

- Mouse is used to operate in the computer.
- Mouse mainly consists of two or three buttons which are pressed to perform an action and this action is called click.
- Mouse has various buttons.
  (a) Left button
  (b) Right button
  (c) 3 Scroll Key



- On the basis of technology, the mouse is divided into 2 parts -
  1- Mechanical Mouse
  2- Optical Mouse

**(ii) Touchpad** - This pointing device is used in laptop instead of mouse.

**(iii) Joystick** - This device is used to move the pointer at a faster speed. It is mainly used for learning computer games.

**(iv) Light Pan** - This device is used for designing works, so it is used for CAD (Computer Added Design).

**(v) Trackball** - This device is mainly used where there is not much space available to move the cursor.

**3. Scanner**
- This device is used to convert a hard copy into a soft copy.
- Both text and graphics can be scanned with the help of Scanner.

**4. Microphone/Mic/Speech Recognisation System**
- This device is used to provide data in the form of voice to the computer.

**5. Biometric Sensor**
- This device is used to input traces of various biological parts of human beings in the computer.

**6. BCR (Barcode Reader)**
- This device is used to read the information stored in the bar code marked on an object.

**7. OMR (Optical Mark Reader)**
- This device is mainly used in the computer to check the multiple choice answer sheet of a candidate.

**8. MICR (Magnetic Ink Character Reader/Recognisation)**
- This device is used in the bank, with its help the numbers printed on a check with magnetic ink can be processed.
- MICR can read only ten digits and 4 special characters.
- MICR character can be read by both machine and human.

**9. OCR (Optical Character Reader)**
- This device is used to make the machine understandable by reading printed or handwritten letters on a question.
- OCR can read only one character at a time.

**10. Smart Card Reader**
- This device is used to read the information stored in the micro chip and magnetic chip in the smart card (Credit/Debit).

## Output Devices

- This device is used to indicate the output provided by the computer.
- Output is provided by the output device in two forms.
  (i) Soft Copy
  (ii) Hard Copy

**Note – The process of making the output provided by the processor understandable to the user is called decode.**

**The outputs are as follows -**

**1. Monitor / Screen/ Display / VDU (Visual Display Unit)**
- The most popular output device in a computer, which is used to represent

the data provided by the computer in the form of soft copy.

- It is of three types -
  (i) CRT – Cathode Ray Tube
  (ii) Flat Panel Display → LED, LCD
  (iii) Plasma Display Monitor

**2. Speaker**

- This device is used to provide audio output.

**3. Projector**

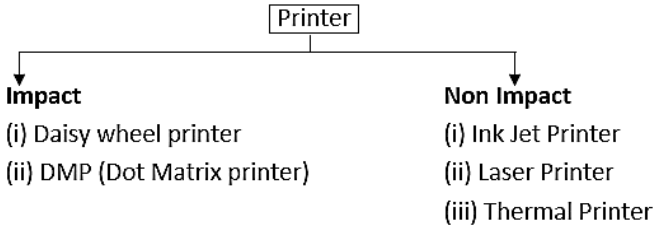
- This device is used to represent the multimedia file stored in the computer.

**4. Plotter**

- It is an output device working similar to a printer.
- Generally this output device is used for engineering works.

**5. Printer**

- This device is used to provide output in the form of hard copy.
- Printers are of two types on the basis of printing technology -




- Printer speed is measured in PPM (Page per minute).