

ST ANTONY'S CONVENT
SCHOOL

Gagore Vijaypur

CHEMISTRY

CLASS : IXth

TOPIC : MATTER IN OUR
SURROUNDINGS

SCIENCE

CHAPTER 1 MATTER IN OUR SURROUNDINGS

Particle Nature of Matter

Anything that occupies space and has mass and is felt by senses is called matter. Matter is the form of five basic elements the Panch tatva – air , earth ,fire , sky and water.

Characteristics of particles of matte

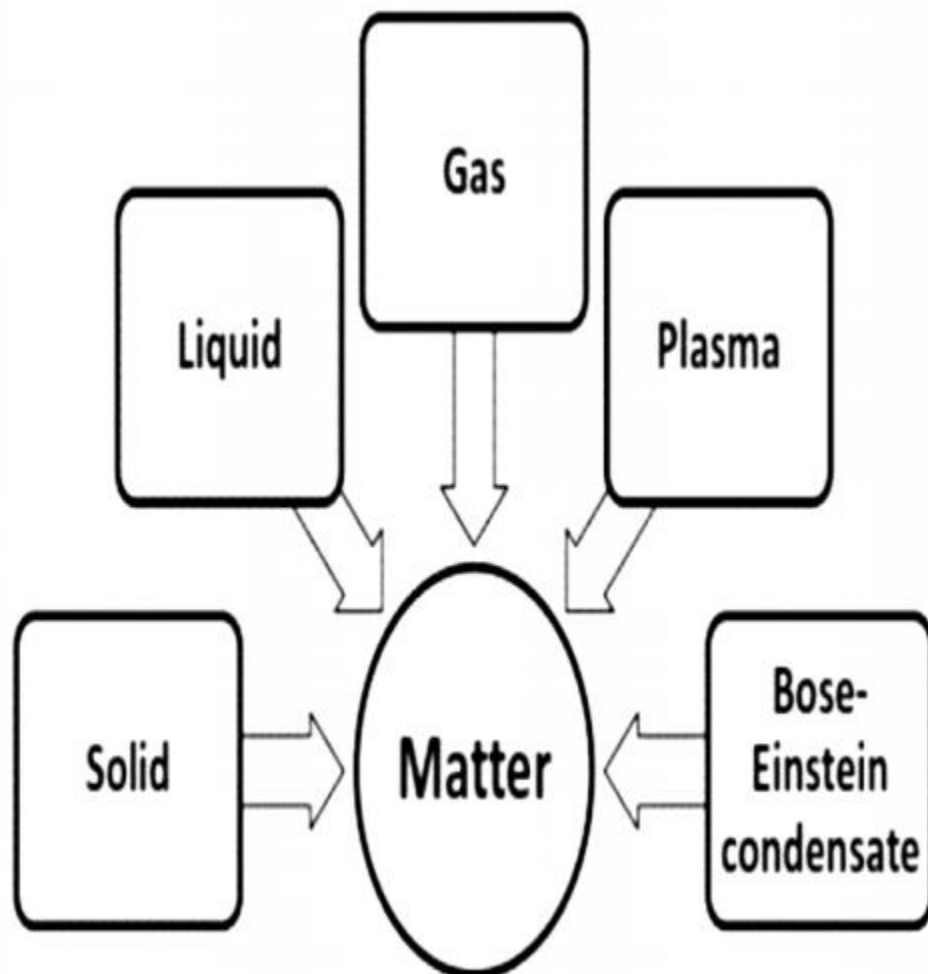
- Made of tiny particles.
- Vacant spaces exist in particles.
- Particles are in continuous motion.
- Particles are held together by forces of attraction.

States of Matter

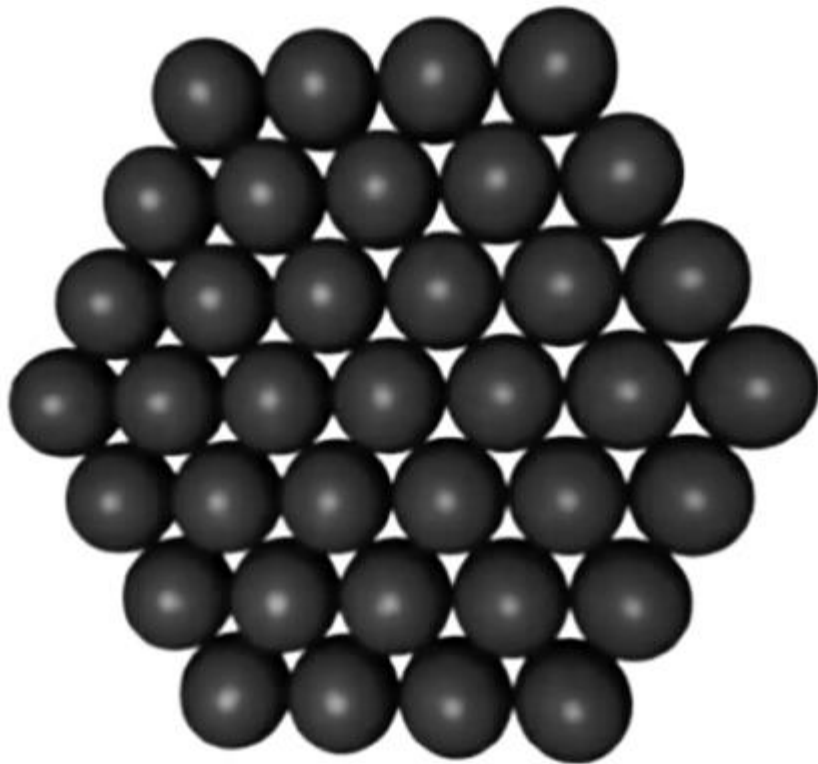
Basis of Classification of Types

- Based upon particle arrangement
- Based upon energy of particles
- Based upon distance between particles

Five states of matter



SOLID



Fixed shape and definite volume

.

Inter particle distances are smallest.

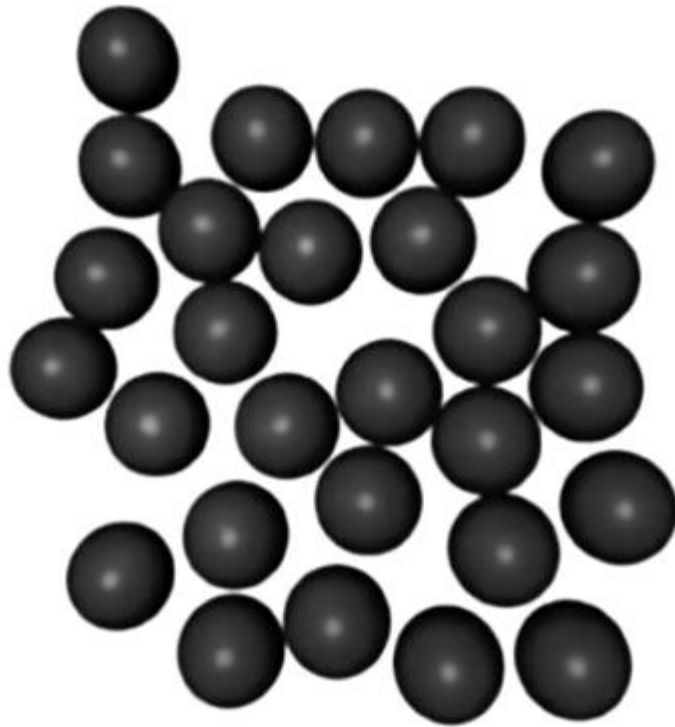
Incompressible.

High density and do not diffuse.

Inter particle forces of attraction are strongest.

Constituent particles are very closely packed.

LIQUID



Not fixed shape but fixed volume.

Inter particle distances are larger.

Almost incompressible.

Density is lower than solids and diffuse.

Inter particle forces of attraction are weaker than solids .

Constituent particles are less closely packed.

Sublimation :

The changing of solid directly into vapours on heating & vapours into solid on cooling. Ex. Ammonium chloride , camphor & iodine.

Bose-Einstein condensate (non –evaluative)

- A BEC is a state of matter that can arise at very low temperatures.
- The scientists who worked with the Bose-Einstein condensate received a Nobel Prize for their work in 1995.
- The BEC is all about molecules that are really close to each other (even closer than atoms in a solid).

Plasma (non –evaluative)

- A plasma is an ionized gas.
- A plasma is a very good conductor of electricity and is affected by magnetic fields.
- Plasma, like gases have an indefinite shape and an indefinite volume. Ex. Ionized gas

Latent Heat :

The hidden heat which breaks the force of attraction between the molecules during change of state.

Fusion	Vaporisation
Heat energy required to change 1kg of solid into liquid.	Heat energy required to change 1kg of liquid to gas at atmospheric pressure at its boiling point.

Factors Affecting Evaporation

- The rate of evaporation increases with an increase of surface area.
- With the increase of temperature, more number of particles get enough kinetic energy to go into the vapour state.
- Humidity is the amount of water vapour present in air. The air around us cannot hold more than a definite amount of water vapour at a given temperature. If the amount of water in air is already high, the rate of evaporation decreases.
- Wind speed : the higher the wind speed , the more evaporation.

Evaporation cause cooling.

The particles of liquid absorb energy from the surrounding to regain the energy lost during evaporation,

Evaporation Vs Boiling (difference)

- Boiling is a bulk phenomenon. Particles from the bulk (whole) of the liquid change into vapour state.
- Evaporation is a surface phenomenon. Particles from the surface gain enough energy to overcome the forces of attraction present in the liquid and change into the vapour state.

Intext Exercise 1

Question 1:

Which of the following are matter?

Chair, air, love, smell, hate, almonds, thought, cold, cold drink, smell of perfume.

Solution 1:

Matter always occupies some space and mass. It can exist in 3 physical states:

- Solid,
- Liquid and
- Gas.

Matter	Reason
Chair, almond	Solid state of matter
Cold drink	Liquid state of matter
Air, smell of perfume (perfume particles in air)	Gaseous states of matter

Love, hate, cold, smell and thought are sensations, so they are not considered as matter.

Question 2:

Give reasons for the following observation:

The smell of hot sizzling food reaches you several metres away, but to get the smell from cold food you have to go close.

Solution 2:

The rate of diffusion increases with increase in temperature due to the increase in the kinetic energy of solid food particles diffused in air. The kinetic energy of hot food particles is high as compared to cold food. Thus, the smell of hot sizzling food reaches us even at a distance, but to get the smell from cold food you have to go close.

Question 3:

A diver is able to cut through water in a swimming pool. Which property of matter does this observation show?

Solution 3:

One of the characteristics of matter is particles of matter attract each other. The force of attraction between the particles is in the order:

Solid > Liquid > Gas

Thus, liquid particles have less force of attraction between them, so we can cut the force of attraction easily. And there is also space in between the particles of matter. That is why, a diver is able to cut through water in a swimming pool.

Question 4:

What are the characteristics of particles of matter?

Solution 4:

Any matter has some characteristics like:

- (i) Particles of matter have space between them.
- (ii) Particles of matter are continuously moving.
- (iii) Particles of matter attract each other.

Intext Exercise 2

Question 1:

The mass per unit volume of a substance is called density (density = mass/volume). Arrange the following in order of increasing density – air, exhaust from chimney, honey, water, chalk, cotton, and iron.

Solution 1:

The order of increasing density of the given matters is:

Air < Exhaust from chimney < Cotton < Water < Honey < Chalk < Iron

Question 2:

- (a) Tabulate the differences in the characteristics of states of matter.
- (b) Comment upon the following: rigidity, compressibility, fluidity, filling a gas container, shape, kinetic energy, and density.

Solution 2:

(a) The differences in the characteristics of states of matter:

S. No.	Solid state	Liquid state	Gaseous state
1.	It has definite shape and volume.	It has no definite shape, but has definite volume. Liquids attain the shape of the vessel in which they are kept.	It neither has a definite shape nor a definite volume.
2.	It is incompressible	It is compressible to a small extent.	It is highly compressible.
3.	The force of attraction between the particles of solids is highest.	The force of attraction between liquid particles is less than solid particles but greater than gas particles.	The force of attraction between the gaseous particles is least.
5.	Particles of solid cannot move freely.	Liquid particles move freely.	Gaseous particles are in a continuous and random motion.

(b) Rigidity: The tendency of matter to resist a change in shape.

Compressibility: The ability to reduce in volume when force is applied.

Fluidity: It is the ability of matter to flow. Only liquid and gases can flow and are called fluid.

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BIOLOGY

CLASS : IXth

TOPIC : "The Fundamental Unit
of Life"

Chapter 5: "The Fundamental Unit of Life"

KEY CONCEPTS : [*rating as per the significance of concept]

CONCEPTS	RATING
Study of historical perceptive related to cell discovery	*****
Study of Microscope	**
Study of Hypotonic/Isotonic/Hypertonic solutions relation to osmosis.	****
Cell wall	***
Nucleus	*****
Cytoplasm	***
Cell organelles	*****

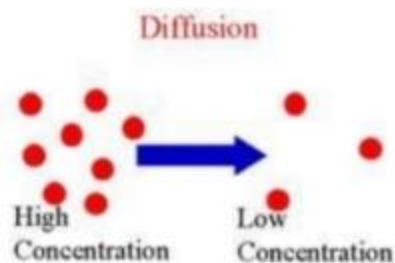
1. All the living organisms are made up of fundamental unit of life called " **cell**".
2. The cell is a Latin word for " **a little room**".
3. The scientist Robert Hooke saw a little room in the cork (the bark of a tree) resembled the structure of a honeycomb. The use of the word "Cell" to describe these units is used till this day in Biology as " **Cell Biology**".
4. The **Compound Microscope** consist eye piece, objective lens and condenser to observe a cell after putting a drop of **Safranin** (for plant cell) and methylene blue (for animal cell). (Please refer to Fig. 5.1: Compound Microscope NCERT Book Page-57)
5. The scientist **Leeuwenhoek** saw **free living cells** in the pond water for the first time. (father of microbiology)
6. The scientist **Robert Brown** discovered the **nucleus** in the cell.
7. The **cell theory** states that all the plants and animals are composed of cells, it was **proposed by Schleiden and Schwann**.
8. The **cell theory** was further expanded by Virchow by suggesting that " **all cells arise from the pre-existing cells**".
9. The cells differ in size, shape, structure (Please refer to Fig. 5.2/5.3: Onion peel/Various cells in Human body, NCERT Book Page-57/58):**Types of cells: Onion cells, Smooth muscle cell, Blood cells, Bone cell, Fat cell, Nerve cell, Ovum, Sperm etc. Each kind of cell performs specific function.**

10. A single cell may constitute a whole organism as in **Amoeba, Chlamydomonas, Paramecium and Bacteria**; these are called as **unicellular organisms**. Whereas in multi-cellular organisms (Human beings) division of labor is seen.

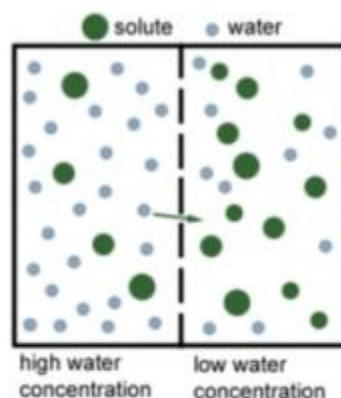
11. **The feature in almost every cell is same: Plasma membrane, nucleus and cytoplasm.**

12. **Plasma membrane:** It is the outermost covering of the cell.

- It is called as **selective permeable membrane** (because it prevents movement of some materials).
- It helps in **diffusion** and osmosis
- Diffusion: movement of substance from high concentration to low concentration.
Eg; exchange of carbon dioxide or oxygen with external environment.



osmosis: it is the passage of water from the region of high water concentration to a region of low water concentration through a selective permeable membrane.



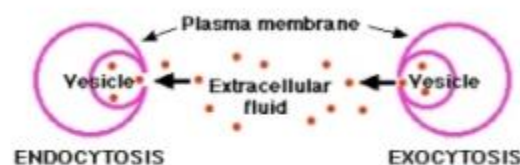
a) The cell gains water, if the medium surrounding the cell has a higher water concentration (**Hypotonic solution**) than the cell.

b) The cell maintains the same water concentration as the cell (**Isotonic solution**), water crosses the cell membrane in both directions.

c)The cell loses water, if the medium has lower water concentration (**Hypertonic solution**) than the cell.

Note - The cell drinking is endosmosis;

- omission of water is called ex-osmosis.



13. The cell engulfs food is called endocytosis and ejects solid is called **exocytosis**. Amoeba acquires food through endocytosis and excretion of solid is called exocytosis.
14. **The cell wall** is a rigid outer covering composed of cellulose. It provides structural strength to plant cells. When a living cell loses water, there is shrinkage of contents of a cell away from the cell wall. This phenomenon is called as **plasmolysis**. The cell walls permit the cells of plants, fungi and bacteria to withstand very dilute (Hypotonic) external media without bursting.
15. **The Nucleus:** It is a dark colored, spherical or oval, dot-like structure near the center of a cell called Nucleus. The nucleus plays a central role in cellular activities/ reproduction. The chromatin material gets organized into chromosomes. The chromosomes contain information for inheritance of features from parents to next generations in the form of **DNA**(Deoxyribo Nucleic Acid) and protein molecules. The functional segments of DNA are called genes.
16. In some organisms like Bacteria nucleus is not covered by nuclear membrane. Hence it is called as **prokaryote**. (Pro= primitive; karyote = karyon = nucleus.) The organisms with cells having a nuclear membrane are called **eukaryotes**.
17. **Differences between prokaryotes and eukaryotes**(Please refer to Fig. 5.4: Prokaryotic cell NCERT Book Page-62)

Prokaryotes	Eukaryotes
Size: generally small (1-10 μm)	Size: generally large. (5-500 μm)

Nuclear region: Not well defined and not surrounded by a nuclear membrane & known as nucleoids.	Nuclear region: Well defined and surrounded by a nuclear membrane
Chromosome: Single	Chromosome: More than one chromosome
Membrane-bound cell organelles absent	Membrane-bound cell organelles present
Eg- bacteria, blue green algae	Eg fungi, plant cell and animal cell.

18. **Cell organelles:** Every cell has fluid matrix (other than nucleus) is called cytoplasm. The nucleus and cytoplasm is together called as protoplasm. The protoplasm term was coined by Purkinje. It has important cell organelles: Endoplasmic Reticulum (ER), Golgi apparatus, Lysosomes, Mitochondria, Plastids, and vacuoles.

19. **Endoplasmic Reticulum (ER):** It is a large network of membrane –bound tubules and vesicles.

- There are two types of Endoplasmic Reticulum
- Rough Endoplasmic Reticulum (RER) (It looks rough because Ribosomes are attached to its surface. They are the sites of protein synthesis).
- Smooth Endoplasmic Reticulum (SER) (It looks smooth because Ribosomes are not attached to its surface. They are the sites of fat molecules synthesis).
 1. SER ; help in the functioning of enzymes and hormones to carryout biochemical activities.
 2. SER detoxifies many poisons and drugs from the cell.
- 2. ER serves as channel for the transport of material between various regions of the cytoplasm and the nucleus.
- 3. Proteins and fat molecules produced by ER helps in membrane biogenesis.

20. **Golgi apparatus:** It was first described by a scientist Camillo Golgi. It is a system of membrane bound vesicles called cisterns. It functions include the storage,

modification and package of cell products. The complex sugars are made from simple sugars in the Golgi apparatus. It is also involved in the formation of lysosomes.

21. **Lysosomes:** They contain membrane-bound sacs with powerful digestive enzymes (enzymes are made by RER) to digest the worn-out cell organelles. When the cell gets damaged, lysosomes may burst and the enzymes digest their own cell, hence called as "Suicidal bags of a cell". It is a waste disposal system of the cell.
22. **Mitochondria:** It is covered by a double membrane. Outer membrane is very porous and the inner membrane is deeply folded. These folds create a large surface area for ATP (Adenosine Triphosphate) molecule synthesis. ATP is the energy currency of a cell; hence the Mitochondria are called as Power House of a Cell. Mitochondria have their own DNA and Ribosomes; therefore they can make their own proteins.
23. **Plastids:** They are present only in plant cells. They are two types.
 1. Chromoplasts (Colored Plastids: Chloroplasts – Green pigmented and useful in Photosynthesis and also contains various other pigments like yellow or orange)
 2. Leucoplasts (White or colorless plastids; stores materials such as oils, proteins, fats etc.) Plastids are also covered by a double membrane. The matrix is called Stroma, seat for enzymatic actions. Plastids have their own DNA and Ribosomes; therefore they can make their own proteins.
24. **Vacuoles:** Storage sacs for solid or liquid contents. They are small in size in animals while plants have large, may occupy 50-90 % of the cell volume. Helps to provide turgidity and rigidity to the cell. Many substances like amino acids, sugars, organic acids and proteins are stored in vacuoles. In Amoeba food vacuole is specialized to play an important role.
25. **Cell:** It is the fundamental structural unit of living organisms, helps in respiration, obtaining nutrition and clearing waste material or forming a new protein.

1. Who discovered cells and how?

Answer

An English Botanist, Robert Hooke discovered cells. In 1665, he used self-designed microscope to observe cells in a cork slice.

2. Why is the cell called the structural and functional unit of life?

Answer

Cells are called the structural and functional unit of life because all the living organisms are made up of cells and also all the functions taking place inside the body of organisms are performed by cells.

3. How do substances like CO_2 and water move in and out of the cell? Discuss.

Answer

The substances like CO_2 and water move in and out of a cell by diffusion from the region of high concentration to low concentration.

When the concentration of CO_2 and water is higher in external environment than that inside the cell, CO_2 and water moves inside the cell. When the concentration outside the cell becomes low and it is high inside the cell, they moves out.

4. Why is the plasma membrane called a selectively permeable membrane?

Answer

Plasma membrane called a selectively permeable membrane because it regulates the movement of substances in and out of the cell. This means that the plasma membrane allows the entry of only some substances and prevents the movement of some other materials.

5. Why are lysosomes known as suicide bags?

Answer

Lysosomes are called suicide bags because in case of disturbance of their cellular metabolism they digest their own cell by releasing own enzymes.

6. Where are proteins synthesized inside the cell?

Answer

The proteins are synthesized in the Ribosome inside the cell.

7. What would happen if the plasma membrane ruptures or breaks down?

Answer

If the plasma membrane ruptures or breakdown then the cell will not be able to exchange material from its surrounding by diffusion or osmosis. Thereafter the protoplasmic material will be disappeared and the cell will die.

8. What would happen to the life of a cell if there was no Golgi apparatus?

Answer

Golgi apparatus has the function of storage modification and packaging of the products. If there is no Golgi apparatus then the packaging and transporting of materials synthesized by cell will not happen.

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PHYSICS

CLASS : IXth

TOPIC : MOTION

Introduction

- **Rest:** A body is said to be in a state of rest when its position does not change with respect to a reference point.

- **Motion:** A body is said to be in a state of motion when its position change continuously with reference to a point.

→ Motion can be of different types depending upon the type of path by which the object is going through.

(i) Circulatory motion/Circular motion – In a circular path.

(ii) Linear motion – In a straight line path.

(iii) Oscillatory/Vibratory motion – To and fro path with respect to origin.

Distance and Displacement

→ The actual path or length travelled by a object during its journey from its initial position to its final position is called the distance.

→ Distance is a scalar quantity which requires only magnitude but no direction to explain it.

Example: Ramesh travelled 65 km.

(Distance is measured by odometer in vehicles.)

→ Displacement is a vector quantity requiring both magnitude and direction for its explanation.

Example: Ramesh travelled 65 km south-west from Clock Tower.

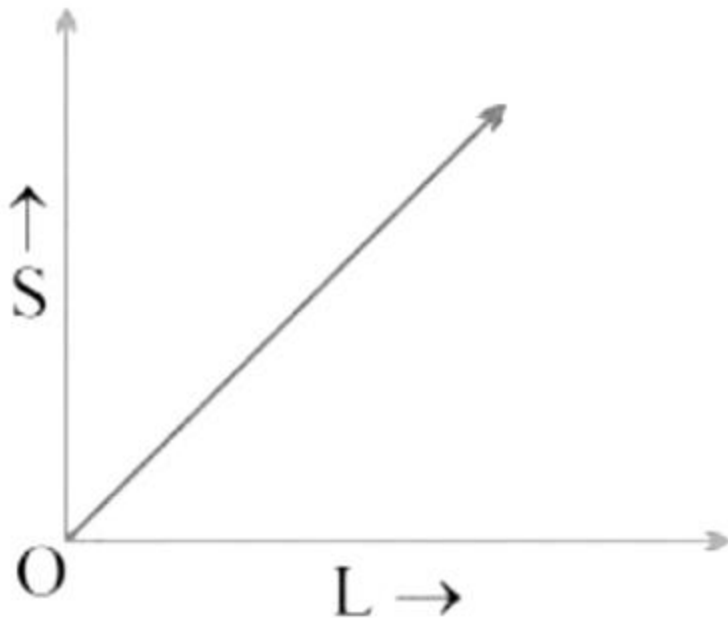
Distance	Displacement
Length of actual path travelled by an object.	Shortest length between initial point and far point of an object.
It is scalar quantity.	It is vector quantity.
It remains positive, can't be '0' or negative.	It can be positive (+ve), negative (-ve) or zero.
Distance can be equal to displacement (in linear path).	Displacement can be equal to distance or its lesser than distance.



Uniform and Non-uniform Motions

Uniform Motion

→ When a body travels equal distance in equal interval of time, then the motion is said to be uniform motion.



Non-uniform Motion

→ In this type of motion, the body will travel unequal distances in equal intervals of time.

Speed

→ The measurement of distance travelled by a body per unit time is called speed.

• Speed (v) = Distance Travelled/Time Taken = s/t

• SI unit = m/s (meter/second)

→ If a body is executing uniform motion, then there will be a constant speed or uniform motion.

→ If a body is travelling with non-uniform motion, then the speed will not remain uniform but have different values throughout the motion of such body.

Velocity

→ It is the speed of a body in given direction.

- $\text{Velocity} = \text{Displacement}/\text{Time}$

→ Velocity is a vector quantity. Its value changes when either its magnitude or direction changes.

→ For non-uniform motion in a given line, average velocity will be calculated in the same way as done in average speed.

- $\text{Average velocity} = \text{Total displacement}/\text{Total time}$

- For uniformly changing velocity, the

Acceleration

→ Acceleration is seen in non-uniform motion and it can be defined as the rate of change of velocity with time.

• Acceleration (a) = Change in velocity/Time = $(v-u)/t$

where, v = final velocity, u = initial velocity

→ If $v > u$, then 'a' will be positive (+ve).

Retardation/Deacceleration

→ Deacceleration is seen in non-uniform motion during decrease in velocity with time. It has same definition as acceleration.

1. An object has moved through a distance. Can it have zero displacement? If yes, support your answer with an example.

Answer

Yes, an object can have zero displacement even when it has moved through a distance. This happens when final position of the object coincides with its initial position. For example, if a person moves around park and stands on place from where he started then here displacement will be zero.

2. Which of the following is true for displacement?

(a) It cannot be zero.

(b) Its magnitude is greater than the distance travelled by the object.

Answer

None of the statement is true for displacement. First statement is false because displacement can be zero.

Second statement is also false because displacement is less than or equal to the distance travelled by the object.

3. Distinguish between speed and velocity.

Answer

Speed	Velocity
Speed is the distance travelled by an object in a given interval of time.	Velocity is the displacement of an object in a given interval of time.
Speed = distance / time	Velocity = displacement / time
Speed is scalar quantity i.e. it has only magnitude.	Velocity is vector quantity i.e. it has both magnitude as well as direction.

4. Under what condition(s) is the magnitude of average velocity of an object equal to its average speed?

Answer

The magnitude of average velocity of an object is equal to its average speed, only when an object is moving in a straight line.

5. What does the path of an object look like when it is in uniform motion?

Answer

An object having uniform motion has a straight line path.

6. During an experiment, a signal from a spaceship reached the ground station in five minutes. What was the distance of the spaceship from the ground station? The signal travels at the speed of light, that is, $3 \times 10^8 \text{ m s}^{-1}$.

Answer

$$\text{Speed} = 3 \times 10^8 \text{ ms}^{-1}$$

$$\text{Time} = 5 \text{ min} = 5 \times 60 = 300 \text{ secs.}$$

$$\text{Distance} = \text{Speed} \times \text{Time}$$

$$\text{Distance} = 3 \times 10^8 \text{ ms}^{-1} \times 300 \text{ secs.} = 9 \times 10^{10} \text{ m}$$

7. When will you say a body is in (i) uniform acceleration? (ii) non-uniform acceleration?

Answer

(i) A body is said to be in uniform acceleration if it travels in a straight line and its velocity increases or decreases by equal amounts in equal intervals of time.

(ii) A body is said to be in nonuniform acceleration if the rate of change of its velocity is not constant.

8. A bus decreases its speed from 80 km h⁻¹ to 60 km h⁻¹ in 5 s. Find the acceleration of the bus.

Answer

$$\text{Initial speed of the bus, } u = 80 \text{ km/h} = 80 \times \frac{5}{18} = 22.22 \text{ m/s}$$

$$\text{Final speed of the bus, } v = 60 \text{ km/h} = 60 \times \frac{5}{18} = 16.66 \text{ m/s}$$

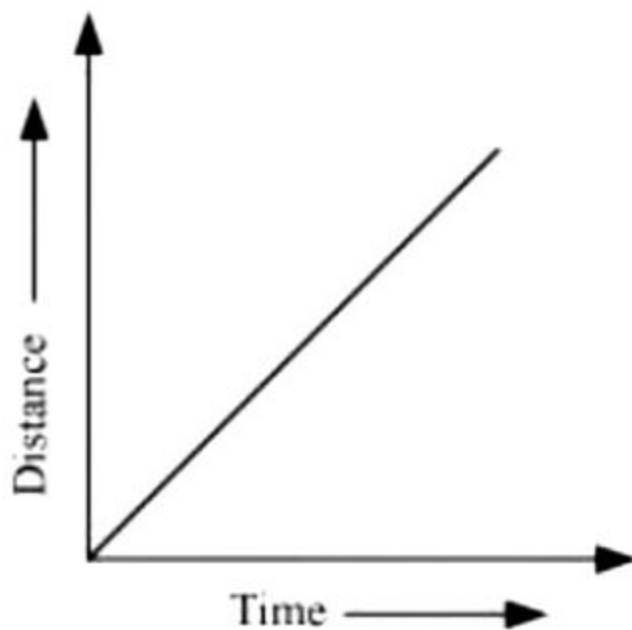
Time take to decrease the speed, $t = 5 \text{ s}$

$$\text{Acceleration, } a = \frac{v-u}{t} = \frac{16.66 - 22.22}{5} = -1.112 \text{ m/s}^2$$

9. What is the nature of the distance - 'time graphs for uniform and non-uniform motion of an object?

Answer

When the motion is uniform, the distance time graph is a straight line with a slope.



When the motion is non uniform, the distance time graph is not a straight line. It can be any curve.