DELHI PUBLIC SCHOOL, JAMMU

SESSION (2021-22)

FOUNDATION WORKSHEET

SUBJECT-SCIENCE

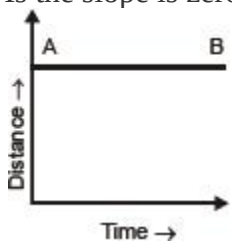
CLASS-IX

PHYSICS

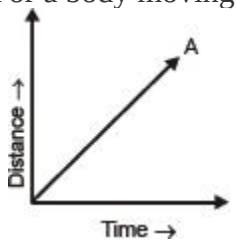
CHAPTER:MOTION

Distance-Time Graphs

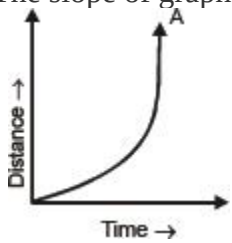
- For a body at rest
- As the slope is zero, so speed of the body is zero.



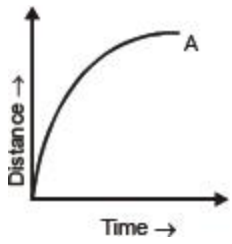
- For a body moving with uniform speed



- For accelerated motion.
- The slope of graph is increasing with time

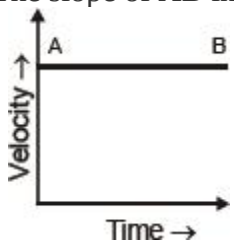


- For decelerated (speeding down) motion.
- Slope of graph is decreasing with time

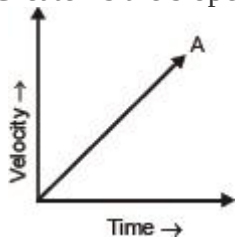


Velocity–Time Graphs

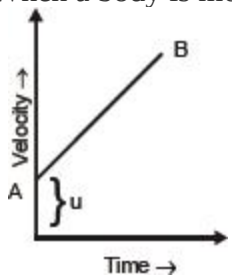
- When a body moving with a uniform velocity.
- The slope of AB indicates zero acceleration



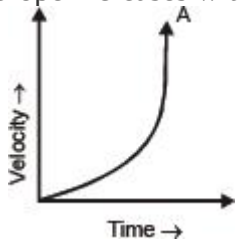
- When a body starts from rest and moves with uniform acceleration.
- Greater is the slope of v-t graph, greater will be the acceleration



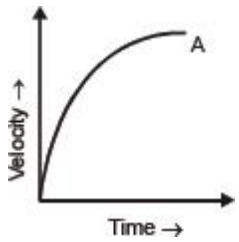
- When a body is moving with uniform acceleration and its initial velocity is not zero.



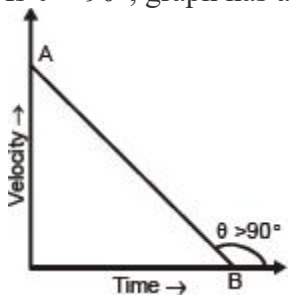
- When a body is moving with increasing acceleration.
- Slope increases with time.



- When a body is moving with decreasing acceleration.
- Slope decreases with time.



- When a body is moving with a uniform retardation and its initial velocity is not zero.
- As $\theta > 90°$, graph has a negative slope.



Facts that Matter

- An object is said to be in motion when its position changes with time.
- We describe the location of an object by specifying a reference point. Motion is relative. The total path covered by an object is said to be the distance travelled by it.
- The shortest path/distance measured from the initial to the final position of an object is known as the displacement.
- **Uniform motion:** When an object covers equal distances in equal intervals of time, it is said to be in uniform motion.
- **Non-uniform motion:** Motions where objects cover unequal distances in equal intervals of time.
- **Speed:** The distance travelled by an object in unit time is referred to as speed. Its unit is m/s.
- **Average speed:** For non-uniform motion, the average speed of an object is obtained by dividing the total distance travelled by an object by the total time taken.

$$\text{Average speed } (v) = \frac{\text{Total distance travelled}(s)}{\text{Total time taken } (t)}$$

- **Velocity:** Velocity is the speed of an object moving in definite direction. S.I. unit is m/s.

$$\text{Average velocity} = \frac{\text{initial velocity} + \text{final velocity}}{2}$$

$$\therefore V_{av} = \frac{u+v}{2}$$

u = initial velocity

v = final velocity

- **Acceleration:** Change in the velocity of an object per unit time.

$$\text{Acceleration } a = \frac{v-u}{t} \quad \text{S.I. unit is m/s}^2$$

- **Graphical representation of motions**

  (i) Distance-time graph

  For a distance-time graph time is taken on x-axis and distance is taken on y-axis.

[Note: All independent quantities are taken along the x-axis and dependent quantities are taken along y-axis.]

OA = CD = u

OE = CB = v

OC = AD = t

BD = BC – DC (Change in velocity)

AD is parallel to OC.

∴ BC = BD + DC = BD + OA

∴ BC = v and OA = u

We get v = BD + u

∴ BD = v – u ...(1)

In velocity-time graph, slope gives acceleration.

$$\therefore a = \frac{BD}{AD} = \frac{BD}{OC}$$

$$\therefore OC = t \text{ we get } a = \frac{BD}{t}$$

$$\therefore BD = at \quad ...(2)$$

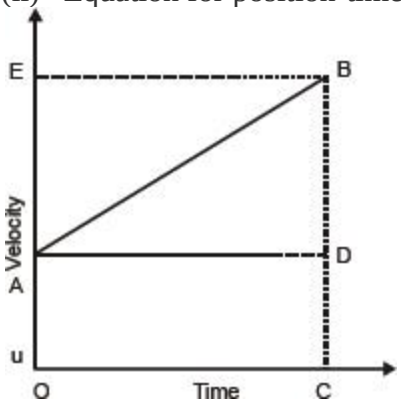
Substituting (2) in (1) we get

BD = v – u

at = v – u

∴ v = u + at

(ii) Equation for position-time relation:



Let us assume,

s = distance travelled by the object

t = in time t

a = with uniform acceleration.

∴ Distance travelled by the object is given by area enclosed with OABC in the graph.

∴ s = OABC

= (area of rectangle OADC) + (area of DABD)

$$= (OA \times OC) = \frac{1}{2}(AD \times BD)$$

Substituting

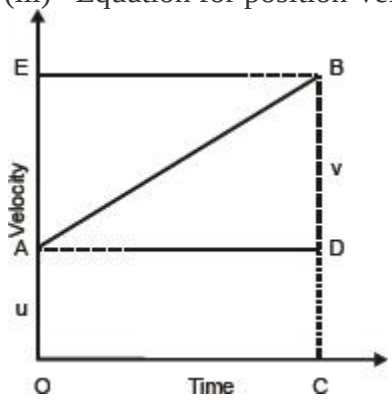
OA = u, OC = AD = t and BD = at

We get

$s = ut + \frac{1}{2}(t \times at)$

$\therefore\ s = ut + \frac{1}{2}at^2)$

(iii) Equation for position-velocity relation:



s = distance travelled by the object

t = in time t

a = moving with uniform acceleration

s = area enclosed by trapezium OABC

$\therefore\ s = \frac{(OA + BC) \times OC}{2}$

$\therefore$ OA = u, BC = v and OC = t.

$\therefore\ s = \frac{(u + v)t}{2}$ ...(1)

Slope $t = \frac{v - u}{a}$ from the graph ...(2)

Substitute value of 't' in (1)

$\therefore\ s = \frac{v + u}{2} \times \frac{(v - u)}{a}$

$s = \frac{v^2 - u^2}{2a}$

$\therefore\ v^2 - u^2 = 2ac$

• **Uniform circular motion:** When a body moves in a circular path with uniform speed, its motion is called uniform circular motion.

Work Sheet

Very short questions

1. Define the term displacement. Is it a vector quantity or a scalar quantity?
2. What is circular motion? Is circular motion an acceleration motion?
3. Derive mathematically the first equation of motion V=u + at?

Short answer type questions

4. A boy runs for 20 min. at a uniform speed of 18km/h. At what speed should he run for the next 40 min. so that the average speed comes 24km/hr.
5. A train accelerated from 10km/hr to 40km/hr in 2 minutes. How much distance does it cover in this period? Assume that the tracks are straight?
6. A train starts from rest and accelerate uniformly at the rate of 5 m/s^2 for 5 sec. Calculate the velocity of train in 5 sec.
7. A bullet leaves a rifle with a muzzle velocity of 1042 m/s. While accelerating through the barrel of the rifle, the bullet moves a distance of 1.680 m. Determine the acceleration of the bullet (assume a uniform acceleration)
8. A bike riding at 22.4 m/s skids to come to a halt in 2.55 s. Conclude the skidding distance of the bike.
9. A race scooter is seen accelerating uniformly from 18.5 m/s to 46.1 m/s in 2.47 seconds. Determine the acceleration of the scooter and the distance travelled.
10. A car is travelling with a speed of 36 km/h. The driver applied the brakes and retards the car uniformly. The car is stopped in 5 sec. Find (i) The acceleration of car and (ii) Distance before it stops after Appling breaks?
11. Can displacement be zero? If yes, give two examples of such situations.

Long answer type questions

12. Prove that $S=ut+1/2at^2$ graphically.

Chemistry

Chapter: Matter In Our Surroundings

Introduction:

Matter: Matter is anything which occupies space, has mass and can be felt by one or more of the five senses,(i.e; sight, touch, smell, hearing and taste). e.g; book, table, milk, oil, air, oxygen etc. are matter. But heat, light, sound, shadow, love, hate are not matter as they are massless and do not occupy space.

➢ Physical Nature of Matter:

1. Matter is made up of particles:-

Activity:- Let us take water, in a beaker and mark the level of water. Dissolve some salt or sugar with the help of a glass rod. Observe any change in water level. Do you think it has changed? No, the water level has not changed. To understand we need to use the idea that matter is made up of particles. The salt or sugar has now spread throughout water. Water particles have some spaces, which are occupied by salt or sugar particles. That is why the water level in the beaker does not change.

2. How small are these particles of matter?

Activity: Let us take 2-3 crystals of potassium permanganate and dissolve them in 100 ml of water, in a beaker.Take out approximately 10 ml of this solution and put it into 90 ml of clear water. Take out 10 ml of this solution and put it into another 90 ml of clear water. Keep diluting the solution like this 5 to 8 times. Is the water still coloured?
This experiment shows that just few crystals of potassium permanganate can colour a large volume of water.
Hence we conclude that there must be millions of tiny particles in just one crystal of potassium permanganate.
The same activity can be done using 2 ml of Dettol instead of potassium permanganate. The smell can be detected even on repeated dilution.

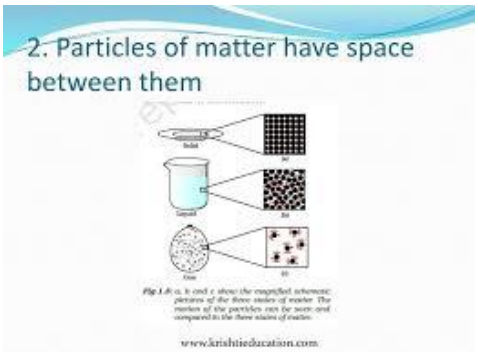
➢ Characteristics of particles of Matter.

1. **PARTICLES OF MATTER HAVE SPACE BETWEEN THEM:**
   Activity: **When we dissolve salt/sugar in water, the particles of salt/sugar get into the spaces between particles of water.**
   Equipment's Required: - Beaker, Water, Salt/ Sugar, and a glass rod.
   Working:

1.Take a 100 ml beaker.

2. Fill half the beaker with water and mark the level of water.

3. Dissolve some salt/ sugar with the help of a glass rod.
4. Notice the water level.
5. **Observations:**
6. When sugar/salt is dissolved in water, the particles of sugar disappear in water. This happens because particles of sugar/salt get adjusted in the spaces between the particles of water.
7. Additionally, you will notice that there is no rise of water level takes place when one or two teaspoons of sugar is added in a glass of water, this is because sugar particles get adjusted in the space between the particles of water and no rise in the water level comes in result.
8. This activity shows us that Matters are made of small particles. And there is space between these particles.



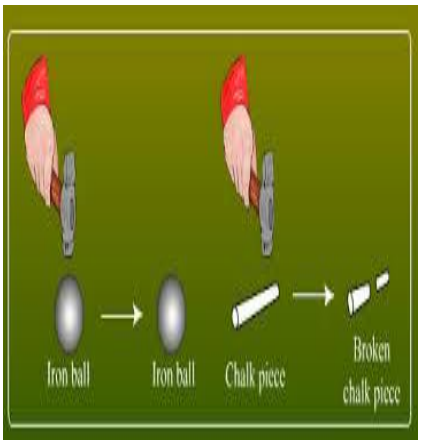
2. PARTICLES OF MATTER ARE CONTINUOUSLY MOVING:

- in all states of **matter** are in constant **motion,** t**Particles** hat is, they possess kinetic energy. A rise in temperature increases the kinetic energy and speed of **particles**.The **particles** in solids vibrate about fixed positions; even at very low temperatures.

3. PARTICLES OF MATTER ATTRACT EACH OTHER:

- There's a force that acts on the particulate matter that keeps it together. Some substances change into powder, some others change into small crystals and others don't break easily. The magnitude of the force of attraction varies from matter to matter, i.e. depends on the nature of the matter.

For example, breaking a chalk is easier than breaking a nail. This proves that attraction varies from particles of one substance to another.



Worksheet

Very Short answer questions

1. What is matter?

2. Which of the following are matter? Chair, air, love, smell, hate, almonds, thought, cold, lemon water, smell of perfume.

Short answer questions

1. What do you observe when salt is added to the water?
2. Why are we able to cut through the water stream by our hand?
3. What is diffusion?
4.

Long answer questions

1. What are the characteristics of particles of matter?
2. Why does the smell of hot food reach us several meters away.

BIOLOGY

CHAPTER-FUNDAMENTAL UNIT OF LIFE:CELL

Cell

It is the structural and functional unit of life.

- **Cell is termed as the structural unit of life as it** provides structure to our body.
- **Cell is considered as the functional** unit of life as all the functions of the body take place at cell level.

Discovery of cell:

- Discovered by Robert Hooke in 1665.
- Robert Brown in 1831 discovered the nucleus in the cell.

Cell Theory:

Cell theory states that:

- All living organisms are composed of cells.
- Cell is the fundamental unit of life.
- All new cells come from pre-existing cells.

Types of Organisms on the Basis of Number of Cells

There are two kinds of organisms on the basis of cells:

(i) Unicellular Organisms: The organisms that are made up of single cell and may constitute a whole organism, are named as unicellular organisms. For example: Amoeba, Paramecium, bacteria, etc.

(ii) Multicellular Organisms: The organisms which are composed of a collection of cells that assume function in a coordinated manner, with different cells specialized to perform particular tasks in the body, are named as multicellular organisms. For example: Plants, human beings, animals, etc.

Shape and Size of Cells

- Cells vary in shape and size. They may be oval, spherical, rectangular, spindle shaped, or totally irregular like the nerve cell.
- The size of cell also varies in different organisms. Most of the cells are microscopic in size like red blood cells (RBC) while some cells are fairly large like nerve cells.

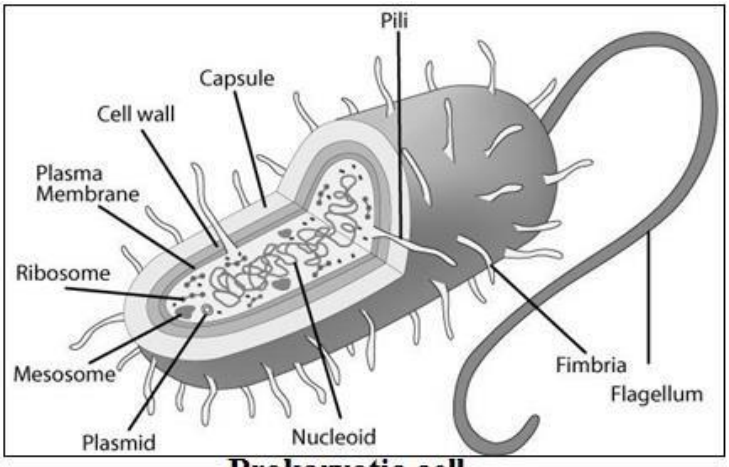
Types of Cells

The cells can be categorized in two types:

1. Prokaryotic Cell 2. Eukaryotic Cell

1. Prokaryotic cell

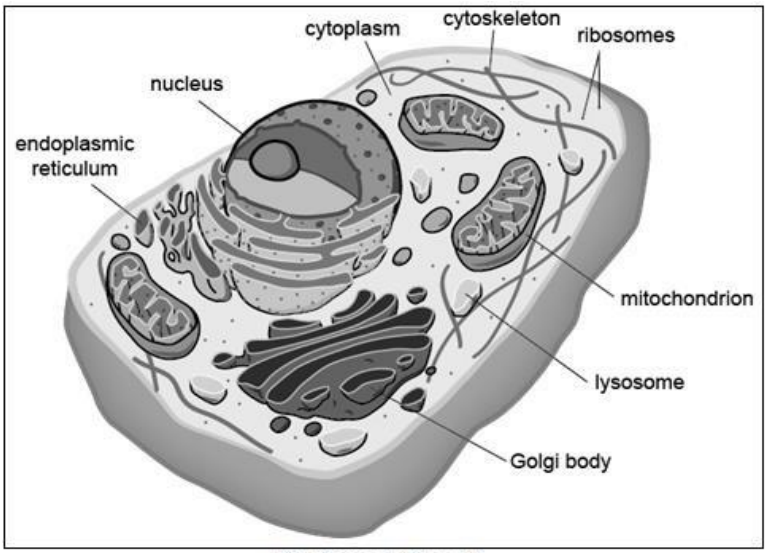
Prokaryotic cells are cells in which true nucleus is absent. They are primitive and incomplete cells. Prokaryotes are always unicellular organisms. For example, archaebacteria, bacteria, blue green algae are all prokaryotes.



Prokaryotic cell

2. Eukaryotic Cell

Eukaryobc cells are the cells in which true nucleus is present. They are advanced and complete cells. Eukaryotes include all living organisms (both unicellular and multicellular organisms) except bactera and blue green algae.



Eukaryotic cell

Difference Between Prokaryotic and Eukaryotic Cells:

S. No.	Prokaryotic cell	Eukaryotic cell
1.	Size of cell is generally small (110 mm).	Size of cell is generally large (5-100 mm).
2.	Nucleus is absent.	Nucleus is present.
3.	It contains single chromosome.	It contains more than one chromosome.
4.	Nucleolus is absent.	Nucleolus is present.
5.	Memrane bound cell organelles are absent.	Memrane bound cell organelles such as mitochondria, plastids, endoplasmic reticulum, golgi apparatus, lysosomes, etc., are present.
6.	Cell division takes place by fission or budding.	Cell division takes place by mitotic or meiotic cell division.

Structure of Cell

Cell is generally composed of three basic components:

(i) Cell wall and cell membrane

(ii) Nucleus

(iii) Cytoplasm

(i) Cell membrane or Plasma membrane:

Plasma membrane is the covering of the cell that separates the contents of the cell from its external environment.
It is a living part of the cell and is present in cells of plants, animals and microorganisms.
It is very thin, delicate, elastic and selectively permeable membrane.
It is composed of lipid and protein.

Function:

As it is selectively permeable membrane, it allows the flow of limited substances in and out of the cell. **(ii) Cell wall:**

cell wall is non-living, thick and freely permeable covering made up of cellulose.
It is present in eukaryotic plant cells and in prokaryotic cells.

Functions:

- It determines the shape and rigidity to the plant cell.
- It protects the plasma membrane.
- It prevents desiccation or dryness in cell.
- It helps in the transport of varous substances in and out of the cell.

(iii) Nucleus:

Nucleus is dense and spherical organelle.
Nucleus is bounded by two membranes, both forming nuclear envelope. Nuclear envelope contains many pores known as nuclear pores.
The fluid which present inside the nucleus is called nucleoplasm.
Nucleus contains chromosomes and chromosomes contain genes which are the centres of genetic information.

Functions:

- Nucleus controls all the metabolic activities of the cell.
- It regulates the cell cycle.
- Nucleus is the storehouse of genes.It is concerned with the transmission of hereditary traits from the parent to offspring. **(iv) Cytoplasm:**

It is a jelly-like, viscous, colourless semi-fluid substance that occurs between the plasma membrane and the nuclear membrane.
The aqueous ground substance of cytoplasm is called cytosol that contains a variety of cell organelles and other insoluble waste products and storage products, like starch, glycogen, lipid, etc.

Functions:

- Protoplasm acts as a store of vital chemicals like amino acids, proteins, sugars, vitamins, etc.
- It is the site of certain metabolic reactions, like glycolysis, synthesis of fatty acids, nucleotides, etc. **Cell organelles:**

Inside the cell there are different parts performing different activities to keep the cell alive anf functionable. These part are called Cell organelles. They are explained below:

1. Golgi Apparatus:

Golgi apparatus consists of a set of membrane bound, fluid filled vesicles, vacuoles and flattened cisternae (closed sacks).
Cisternae are usually arranged parallel to each other.

Functions:

- Its main function is to store, modify, package and dispatch the substances.
- It is also involved in the synthesis of cell wall, plasma membrane and lysosomes.

2. Endoplasmic Reticulum:

It is a membranous network of tube like structures extending from nuclear membrane to plasma membrane.
It is absent in prokaryotic cells and matured RBCs of mammals.
There are two types of endoplasmic reticulum: (i) Rough Endoplasmic Reticulum (RER): Here ribosomes are present on the surface for the synthesis of proteins. (ii) Smooth Endoplasmic Reticulum (SER): Here ribosomes are absent and is meant for secreting lipids.

Functions:

- It gives internal support to cell.
- It helps in transport of various substances from nuclear membrane to plasma membrane or vice versa.

- RER helps in synthesis and transportation of proteins.
- SER helps in synthesis and transportation of lipids.

3. Ribosomes:

These are extremely small, dense and spherical bodies which occur freely in the matrix (cytosol) or remain attached to the endoplasmic reticulum.
These are made up of ribonucleic acid (RNA) and proteins.

Function:

They play a major role in the synthesis of proteins.

4. Mitochondria:

They are small rod-shaped organelles.
It is a double membrane structure with outer membrane being smooth and porous whereas inner membrane being thrown into a number of folds called cristae.
They contain their own DNA and ribosomes.
They are absent in bacteria and red blood cells of mammals.

Functions:

- They are the sites of cellular respiration, hence provide energy for the vital activities of living cells.
- They store energy releases during reactions, in the form of ATP (Energy currency of the cell). Therefore, they are also called ‘power house’ of the cell.

5. Centrosome and Centrioles:

Centrosome is found only in eukaryotic animal cells. It is not bounded by any membrane but consists of centrioles.
Centroles are hollow cylindrical structures arranged at right angle to each other and made up of microtubules.

Function:

Centrioles help in cell division and also help in the formation of cilia and flagella.

6. Plastids:

Plastids are present in most of the plant cells and absent in animal cells.
They are usually spherical or discoidal in shaped and double membrane bound organelles.
They also have their own DNA and ribosomes.

Plastids are of three types:
(a) Chloroplasts: These are the green coloured plastids containing chlorophyll. Chloroplasts aid in the manufacture food by the process of photosynthesis.
(b) Chromoplasts: These are the colourful plastids (except green colour).
(c) Leucoplasts: These are the colourless plastids.

Function:

- Chloroplasts trap solar ebergy and utilise it to manufacture food for the plant.
- Chromoplasts impart various colours to flowers to attract insects for pollination.
- Lecuoplasts help in the storage of food in the form of starch, proteins and fats.

7. Lysosomes:

Lysosomes are small, spherical, sac like structures which contain several digestive enzymes enclosed in a membrane.

They are found in eukaryotic cells mostly in animals.

Functions:

- Lysosomes help in digestion of foreign substances and worn-out cell organelles.
- They provide protection against bacteria and virus.
- They help to keep the cell clean.
- During the disturbance in cellular metabolism, for example when the cell gets damaged, lysosomes may burst and the enzymes digest their own cell. Therefore, lysosomes are also known as **suicide bags** of a cell

8. Vacuoles:

Vacuoles are liquid/solid filled and membrane bound organelles.

In plant cells, vacuoles are large and permanent. In animal cells, vacuoles are small In size and temporary.

In mature plant cell, It occupies 90% space of cell volume.

Due to its size, other organelles, including nucleus shift towards plasma membrane.

Function:

- They help to maintain the osmotic pressure in a cell.
- They provide turgidity and rigidity to the plant cell.

9. Peroxiomes:

They are small and spherical organelles containing powerful oxidative enzymes.

They are bounded by a single membrane.

They are found in kidney and liver cells.

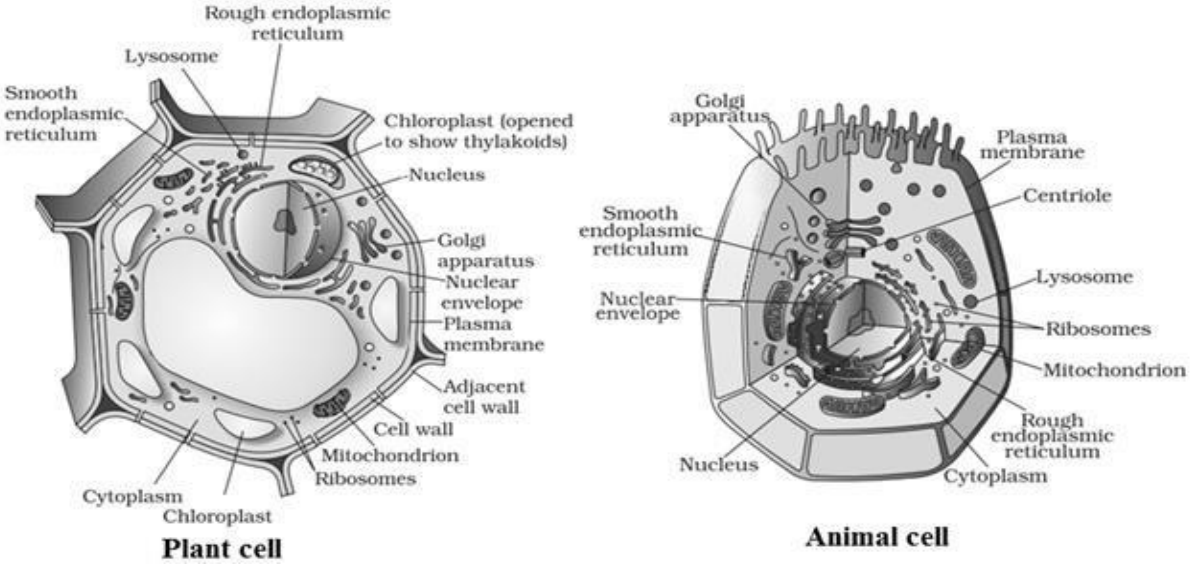
Function:

- They are specialized to carry out some oxidative reactions, such as detoxification or removal of toxic substances form cell.

Difference Between Animal Cell and Plant Cell:

S. No.	Animal cell	Plant cell
1.	Animal cells are generally small in size.	Plant cells are larger than animal cells.
2.	Cell wall is absent.	Plasma membrane of plant cell is surrounded by a rigid cell wall of cellulose.
3	Plastids are absent except in case of protozoan Euglena.	Plastids are present.
4.	Here vacuoles are many, small and temporary.	They have a permanent and large central sap vacuole.
5.	They have centrosome and centrioles.	They lack centrosome and centrioles.

Structure of Plant cell and Animal cell:



VERY SHORT ANSWER TYPE QUESTIONS

Q1. What is the characteristic of nuclear envelope?

Q2. Where does ATP synthesis occur in mitochondria?

Q3. What would happen if the plasma membrane ruptures or break down?

Q4. Why are lysosomes known as suicide bags?

SHORT ANSWER TYPE QUESTIONS

Q5. Why Plant cells are are more rigid than animal cells?

Q6. Explain the process of osmosis in detail.

Q7 Draw and label diagrams of plant cell and animal cell.

LONG ANSWER TYPE QUESTIONS

Q8. Explain the difference between Prokaryotic cell and Eukaryotic cell (4 marks)

Q9. What are genes? What is the difference between genes and chromosomes? (3 marks)

Q10. Why are lysosomes called suicidal bags? (2 marks)

Q11. Draw a neat diagram of a plant cell .

NOTE: Kindly read the above detail of each subject and do the questions in your physics, chemistry and biology notebook.(interleaf notebook).