Delhi Public School, Gandhinagar

Class: IX **Subject: Science**

Chapter-1 Matter in Our Surroundings

Pg. No. 3

Q.1 **Which of the following are matters? (to be discussed in class)**

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

A.1 Anything that occupies space and has mass is called matter. Matter can exist in three physical states—solid, liquid, and gaseous.

Chair and almond are forms of matter in the solid state.

Cold drink is a liquid state of matter.

Air and smell of perfume are gaseous states of matter.

Q.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.

A.2 The vapours (molecules) coming out from hot sizzling food have higher temperature than cold food and at higher temperature rate of diffusion is high, due to which the smell of hot sizzling food reaches us from several metres away.

Q.3 **A diver is able to cut through water in a swimming pool. Which property of matter does this observation show?**

A.3 A diver is able to cut through water in a swimming pool because**:**

i) The inter particle space is large in water.

ii) The inter particle force of attraction is low.

Q.4 **What are the characteristics of particles of matter?**

A.4 The characteristics of particles of matter are**:**

i) Particles of matter have spaces between them.

ii) Particles of matter are continuously moving.

iii) Particles of matter attract each other.

Pg. No. 6

Q.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 chimneys, honey, water, chalk, cotton and iron.(to be discussed in class)**

A.1 The given substances in the increasing order of their densities can be represented as:

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

Q.2 (a) **Tabulate the differences in the characteristics of states of matter.**

A.2

S.No	Property	Solid state	Liquid state	Gaseous state
1.	**Shape and volume**	Definite shape and volume	Indefinite shape but definite volume	Indefinite shape and volume
2.	**Inter particle force of attraction**	Strong inter particle force	Moderate inter particle force	Weak inter particle force
3.	**Inter particle space**	Negligible	Moderate	Very large
4.	**Nature**	Hard and rigid	Fluid	Fluid
5.	**Rate of diffusion**	Negligible	It depends on inter-particular attraction.	Maximum

(b) **Comment upon the following: rigidity, compressibility, fluidity, filling a gas container, shape, kinetic energy, and density.**

i) Rigidity can be expressed as the tendency of matter to resist a change in shape.

ii) Compressibility is the ability to be reduced to a lower volume when force is applied.

iii) Fluidity is the ability to flow.

iv) By filling a gas container, we mean the attainment of shape of the container by gas.

v) Shape defines a definite boundary.

vi) Kinetic energy is the energy possessed by a particle due to its motion.

vii) Density is mass per unit volume.

Q.3 **Give reasons:**

(a) **A gas fills completely the vessel in which it is kept.**

A.3 The force of attraction between particles of a gas is negligible hence particles freely move/flow in all possible directions as a result a gas fills the vessel completely in which it is kept.

(b) **A gas exerts pressure on the walls of the container.**

Particles of gas move randomly in all directions at high speed. As a result the particles collide with each other and also hit the wall of the container with a force. Therefore, gas exerts pressure on the walls of the container.

(c) **A wooden table should be called a solid.**

The constituents of wooden table (particles) are quite rigid, have a fixed location and also possess a definite shape and volume. Due to all these properties we should call a wooden table a solid.

(d) **We can easily move our hand in air but to do the same through a solid block of wood we need a karate expert.**

Particles of the air have large spaces between them and weak force of attraction. On the other hand, in wood particles are closely packed and have strong inter-particle force of attraction. As a result, we can move our hand in air but to do the same through a solid block of wood we need a karate expert.

Q.4 **Liquids generally have lower density as compared to solids. But, you must have observed that ice floats on water. Find out why.**

A.4 When water freezes to form ice, it forms cage-like structures within , and some empty spaces known as voids are created. As a result, the volume increases for the same mass of water. In other words, mass per unit volume or density of ice is lower than that of water and hence ice floats over water.

Delhi Public School, Gandhinagar

Class: IX **Subject: Science**

Chapter-1 Matter in Our Surroundings

Pg. No. 9

Q.1 **Convert the following temperature to Celsius scale:**
a) 300 K b)573 K

A.1 (a) 300 K = 300 – 273
= 27^oC

(b) 573 K = 573 − 273°C
= 300°C

Q.2 **What is the physical state of water at: a) 250°C b) 100°C**

A.2 (a) Water at 250°C exists in gaseous state.

(b) At 100°C, water can exist in both liquid and gaseous form.

Q.3 **For any substance, why does the temperature remain constant during the change of state?**

A.3 During a change of state, the temperature remains constant. This is because all the heat supplied to increase the temperature is utilised (as latent heat of vaporization or latent heat of fusion) in changing the state by overcoming the forces of attraction between the particles. Therefore, the temperature remains constant.

Q.4 **Suggest a method to liquefy atmospheric gases (to be discussed in class)**

A.4 By applying pressure and reducing the temperature, atmospheric gases can be liquefied.

Pg. No. 10

Q.1 **Why does a desert cooler cool better on a hot dry day?**

A.1 On a hot dry day temperature of the atmosphere is high and humidity of air is low. Both these factors increase the rate of evaporation and thus enormous cooling is produced.

Q.2 **How does the water kept in an earthen pot (matka) become cool during summer?**

A.2 During summers the water present on the surface of the earthen pot evaporates which causes the cooling effect. Besides this, earthen pot bears pores in it hence evaporation occurs continuously and so a large amount of cooling is produced.

Q.3 **Why does our palm feel cold when we put some acetone or petrol or perfume on it?**

A.3 Acetone, petrol and perfume evaporate at low temperature. When some acetone is dropped on the palm it takes away the heat from the palm and evaporates making palm cooler.

Q.4 **Why are we able to sip hot tea or milk faster from a saucer rather than a cup?**

A.4 A liquid attains a larger surface area in the saucer as compared to a cup. Since evaporation is a surface phenomenon, by using a saucer instead of cup we are increasing the surface are for evaporation to occur. Faster evaporation of particles of tea or milk allows cooling and taking a sip becomes easier.

Q.5 **What type of clothes should we wear in summer?**

A.5 Cotton is a good absorbent of water hence it absorbs sweat quite well and pores in the fabric expose that sweat to the atmosphere, making evaporation faster. During this evaporation, particles on the surface of the liquid gain energy from our body surface, making the body cool hence we should prefer wearing cotton clothes in summer

Exercises

Q.1 **Convert the following temperatures into the Celsius scale. (a) 293 K (b) 470 K**

A.1 (a) 293 K = 293 – 273
= 20^0C

(b) 470 K = 470 – 273
= 197^0C

Q.2 **Convert the following temperatures into the Kelvin scale.**
(a) 25^0C (b) 373^OC

A.2 K = 25^oC + 273
= 25 + 273
= 298K
K =373^oC + 273
= 373 + 273
= 646 K

Q.3 **Give reason for the following observations.**

(a) **Naphthalene balls disappear with time without leaving any solid.**

Naphthalene shows the property of sublimation. Evaporation of naphthalene takes place easily and so it disappears during course of time without leaving a solid.

(b) **We can get the smell of perfume sitting several metres away.**

Perfume being a volatile substance (gets evaporated easily) changes from liquid to gaseous state very fast and its vapours diffuse into air easily. That is why we can smell perfume sitting several meters away.

Q.4 **Arrange the following substances in increasing order of forces of attraction between the particles— water, sugar, oxygen. (to be discussed in class)**

A.4 Oxygen < water< sugar.

Q.5 **What is the physical state of water at—**
(a) 25 ^{o}C (b) 0^oC (c) 100^oC?

A.5 At 25^oC water is liquid, at 0^oC water exists as both liquid and solid (ice), at 100 ^{o} C water exists as both liquid and gas.

Q.6 **Give two reasons to justify—**

A.6 (a) **Water at room temperature is a liquid.**

Water is liquid at room temperature because at this temperature
(i)it has fixed volume and
(ii)it can flow.

(b) **An iron almirah is a solid at room temperature.**

An iron almirah is solid at room temperature because at this temperature
(i) it has definite shape along with fixed volume and
(ii) It cannot flow like water and hence does not possess fluidity

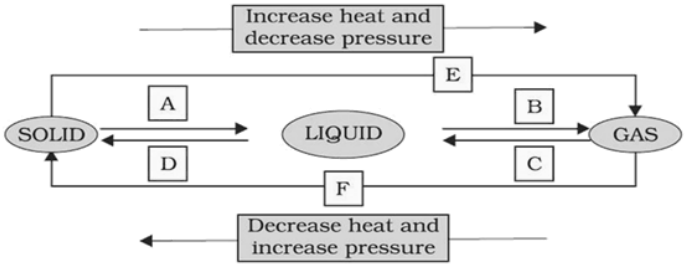
Q.7 **Why is ice at 273 K more effective in cooling than water at the same temperature?**

A.7 While melting ice absorbs latent heat of fusion from the surroundings and gets changed into water that makes the cooling effect more intense as compared to water at same temperature.

Q.8 **What produces more severe burns, boiling water or steam?**

A.8 Steam at 373K has more heat energy equal to the latent heat of vaporisation than boiling water at 373K, therefore steam produces more severe burns than boiling water.

Q.9 **Name A, B, C, D, E and F in the following diagram showing change in its state.**



A.9 A → Melting
B → Boiling
C → Condensation
D → Solidification
E → Sublimation
F → Sublimation

DPS GANDHINAGAR
ACADEMIC YEAR: 2020-21
CLASS IX: SCIENCE (PHYSICS)
CHAPTER-8: MOTION

1) What do you mean by the term 'Kinematics'?

- It is the branch of physics which deals with the **motion without its causes**.

2) Define motion. Give types of motion with suitable example.

- When an object changes its **position** with respect to **time** then that object is said to be in motion.
- **Types of motion:**
  - ✓ **Linear Motion:** a car moving on the straight road
  - ✓ **Circular Motion:** the earth revolves around the sun
  - ✓ **Rotational Motion:** a playing top spins around its axis
  - ✓ **Oscillatory Motion:** to and fro motion of a pendulum of a wall clock
  - ✓ **Projectile Motion:** the motion of a football when it is kicked from ground.

3) Explain the statement: "Rest and motion of an object are relative of each other."

- When an object is said to be in rest then it will be not in motion. Also when an object is said to be in motion then it will be not in rest. Therefore, Rest and motion of an object are relative of each other.

4) Explain the statement: "No absolute motion and rest is possible."

- Rest and motion are always relative. For example, two persons sitting in a moving bus are at rest with respect to each other but are in motion with respect to a person standing on the roadside. Further, trees, buildings, etc. on the surface of the Earth appear to be at rest but in fact they are in motion as the Earth revolves around the Sun. Thus, there is no object which can be considered to be at absolute rest. Hence, rest and motion are relative terms.

5) Differentiate the terms 'Reference point' and 'Reference frame'.

- **Reference Point:** It is a **point or place** in a **reference frame** from where an observer takes an observation.
- **Reference Frame:** The **Reference frame** can be any **area (2 Dimensional)** or **space (3 Dimensional)** from where the observer takes an observation of any body from any reference point whether it is in rest or motion.

6) Define: (a) Scalar Quantity (b) Vector Quantity

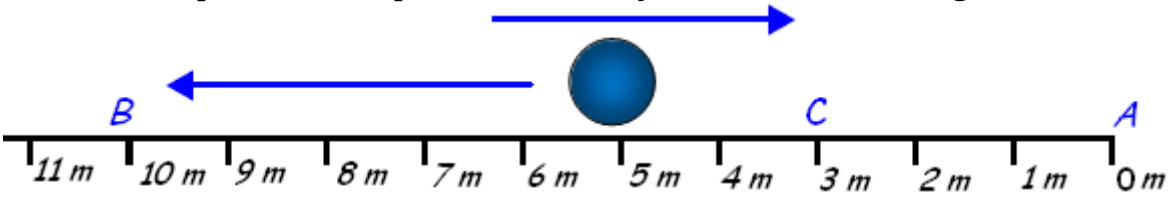
- **Scalar quantity:** The quantity which requires only **magnitude** with no direction.
- **Vector quantity:** The quantity which requires both **magnitude** and **direction**.

7) Give three differences between distance and displacement.

No.	Distance	Displacement
1.	Total length of a path travelled by an object during motion.	Shortest distance between initial point and final point of an object during motion.
2.	It is a scalar quantity.	It is a vector quantity.
3.	It is always positive.	It can be positive, negative or zero.
4.	It is greater or equal to displacement.	It is lesser or equal to distance.

8) An object has moved through a distance. Can it have zero displacement? If yes, support your answer with an example. (In-text Q.1 Pg.No.100)

➢ **Yes**, zero displacement is possible if an object has moved through a distance.

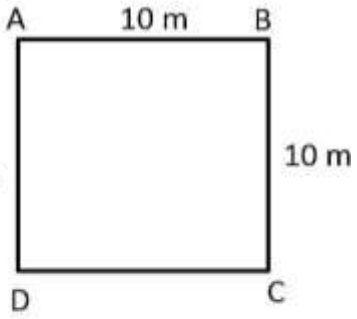


➢ Suppose a ball starts moving from point **A** and it returns back at same point **A**, then the distance will be equal to 20 meters while displacement will be zero.

9) A farmer moves along the boundary of a square field of side 10m in 40s. What will be the magnitude of displacement of the farmer at the end of 2 minutes 20 seconds from his initial? (In-text Q.2 Pg.No.100)

Length of square field = 10 m

Time taken to move along square field = 40 s



Total time the farmer walked on the square field

= 2 min 20 sec

= 2 × 60 + 20 (1 min = 60 s)

= 120 + 20

= 140 s

Total distance covered 10m in 40sec

Total time taken= 2min 20sec= 140sec

Total round completed = 140/40=3.5 rounds

$AC^2 = AB^2 + BC^2$

$= (10)^2 + (10)^2$

$=100+100$

$= 200$

Therefore, AC= $\sqrt{200}$

$= \sqrt{2} \times \sqrt{100}$

$= 10\sqrt{2}$ m

$= 10 \times 1.41$

=14.1 m

10) Which of the following is true for displacement?(In-text Q.3 Pg.No.100)

(a) It cannot be zero. - **False**

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

11) Define speed. Give its SI unit

- The **distance** travelled by an object in **unit time** is called **speed**. **SI unit:** m/s

12) What is the reason behind to take an average speed of a moving object?

The reason behind to take an average speed of a moving object is when an object performs Non-uniform motion.

13) An athlete completes one round of a circular track of diameter 200 m in 40 s. If he continues to run, what will be the distance covered and the displacement at the end of 2 minutes 20 s respectively? (Exercise. Q.1)

R = diameter/2 =200/2 = 100 m

Time for 1 round = 40 seconds

Total time for whole journey = 140 seconds

No. of rounds completed by an athlete = 140/40 = 3.5 rounds

So, distance = $3.5 \times 2\Pi R = 7\Pi R$

$=7 \times 22/7 \times 100$

$=2200$ m

Now, displacement = diameter = 200 m

14) Abdul, while driving to school, computes the average speed for his trip to be 20 km/h. On his return trip along the same route, there is less traffic and the average speed is 30 km/h. What is the average speed for Abdul's trip? (Exercise. Q.3)

Let one way distance $= x$ km

Time taken in forward trip at speed of 20 km/h,

$$\frac{\text{Distance}}{\text{Speed}} = \frac{x}{20} \text{h}$$

Time taken in return trip at a speed of 30 km/h,

$$\frac{\text{Distance}}{\text{Speed}} = \frac{x}{30} \text{h}$$

Total time for the whole trip,

$$\frac{x}{20} + \frac{x}{30} = \frac{3x + 2x}{60} = \frac{5x}{60} \text{h}$$

Total distance covered $= x + x = 2x$ km

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{2x}{5x/60}$$

$$= \frac{2x \times 60}{5x}$$

$$= 24 \text{ km h}^{-1}.$$

15) Define uniform/speed and Non-uniform motion/speed with an example of each.

- **Uniform Motion/Speed:**

  Definition: Uniform motion can be defined as body covers **equal distance** in **equal intervals of time**.

  Example: Motion of the hour/minute/second hand of a clock

  Non-Uniform Motion/Speed:

  Definition: Non-uniform motion can be defined as body covers **unequal distance** in **equal intervals of time**.

  Example: A horse running in a race

16) Convert 108 km/h into m/s

- 108 km/h = (108×1000/3600) m/s = 30 m/s

17) Convert 60 m/s into km/h

- 60 m/s = (60 × 3600/1000) km/h = 216 km/h

18) Define periodic motion. Is an oscillatory motion periodic?

- In **Physics**, motion repeated in equal intervals of time is called a periodic motion.
- Yes, an oscillatory motion is a periodic motion because each oscillation gets completed in a definite time interval of time with repetition.

***

CHAPTER-5
THE FUNDAMENTAL UNIT OF LIFE

Date Slot: **No. of Periods:**

	Scientists and their contribution
1	**Robert Hooke: -** First discovered cells (dead cells) in a cork slice using primitive microscope.
1	**Antony Van Leeuwenhoek: -** First discovered living cell in pond water using simple light microscope. He called these cells "**small animalcules**".
2	**Robert Brown: -** Discovered nucleus.
3	**J. E. Purkinje (1839): -** Coined the term **protoplasm** for the fluid substance of the cell.
4	**Schleiden (1838) and Schwann (1839): -** They proposed **Cell theory,** that stated- i. All plants and animals are composed of cells and cellular products. ii. The cell is the basic unit of life. Viruses are exception to cell theory.
5	**Rudolf Virchow: -** Expanded cell theory by stating that " All cells arises from pre-existing cells" (*Omnis cellula-e-cellula*)
	Important definitions/terms
1	**Permeable membrane:** If a membrane permits movement of solute and solvent molecules freely, it is called permeable membrane.
2	**Semi-permeable membrane:** If a membrane permits movement of solvent molecules only, it is called semi-permeable membrane.
3	**Selectively permeable membrane:** If a membrane permits movement of specific solute molecules along with the solvent molecules freely, is called selectively permeable or differentially permeable membrane.
4	**Impermeable membrane:** If a membrane does not permit movement of solute and solvent molecules, is called impermeable membrane.
5	**Isotonic solution:** When the concentration of the solutes on both sides of cell membrane are same, the solution is called isotonic solution.
6	**Hypotonic solution:** When the concentration of the solute in the solution is lower than intracellular fluid i.e. cytoplasm and cell sap, the solution is called hypotonic solution.
7	**Hypertonic solution:** When the concentration of the solute in the solution is higher than intracellular fluid i.e. cytoplasm and cell sap, the solution is called hypertonic solution.
8	**Endosmosis:** When cells are placed in hypotonic solution, water flows into the cell. This process of osmotic entry of water is called endosmosis.
9	**Exosmosis:** When cells are placed in hypertonic solution, water flows out of the cell. This process of osmotic withdrawal of water is called exosmosis.
10	**Plasmolysis:** Shrinkage of plasma membrane and cell contents away from the cell wall due to exosmosis is called plasmolysis.
11	**Deplasmolysis:** Regain of turgidity by a plasmolysed cell because of endosmosis is deplasmolysis.
12	**Chromatin material:** Thin thread like intertwined mass of filament present in the nucleoplasm is called chromatin material.
13	**Chromosomes:** Condensed chromatin material which contains genes in a linear order is called chromosomes.
14	**Genes:** Segment of DNA (Deoxyribonucleic acid) on chromosomes, responsible for inheritance of characters through successive generations. Such segments of DNA are called

	genes.
15	**Nucleolus:** Spherical body present in the nucleus, which is the site of ribosome synthesis, is called nucleolus.
16	**Nucleoplasm:** Liquid contents of the nucleus are called nucleoplasm.

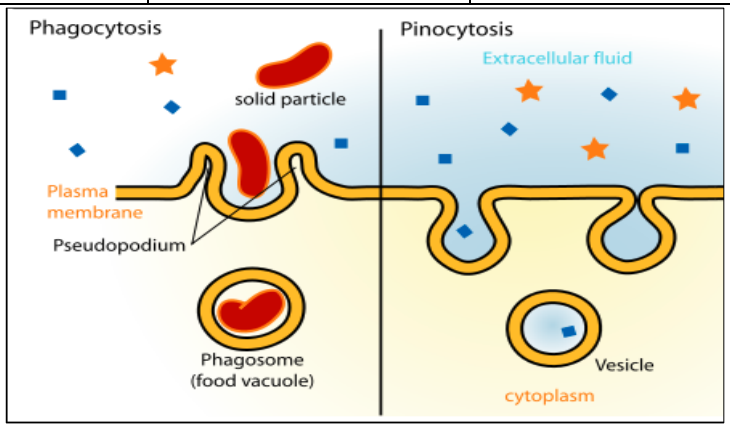
Important Differences

A **OSMOSIS AND DIFFUSION**

S.No	Diffusion	Osmosis
1	Movement of ions or molecules from a region of higher concentration to a region of its lower concentration.	Movement of solvent molecules from a region of higher concentration to its lower concentration through a semi-permeable.
2	Occurs in both air and liquid medium	Occurs only in liquid medium
3	Concentration equilibrium Can be maintained	Concentration equilibrium cannot be maintained

B **PINOCYTOSIS AND PHAGOCYTOSIS:**

S.No	Characteristics	Pinocytosis	Phagocytosis
1	Also known as	Cell drinking	Cell eating or engulfing
2	Materials taken in as	Liquid form	Solid form
3	Process	Nutritive	Both nutritive and defensive
4	Forms	Cell tube (Pinosome)	Food tube (Phagosome)
5	Exhibited by	Amoeba and liver cells	Amoeba for engulfing food, leucocytes for removal of dead bacteria and germs.



C **CHLOROPLAST, CHROMOPLAST AND LEUCOPLAST:**

Characteristics	Chloroplast	Chromoplast	Leucoplast
Nature of plastid	Photosynthesis	Non-photosynthesis	Non-photosynthesis
Colour of pigments	Green pigment	Red, orange or yellow pigments (carotenoids)	Colourless plastids but stores nutrients like starch, lipids and proteins
Occurrence	Mainly in leaves	Fruits or flowers	Mainly in storage organs like roots, seeds and young leaves
Significance	Active site of photosynthesis	Attract insects for pollination, source of vitamins	Involved in synthesis and storage of carbohydrates, oil and protein.

D **ROUGH ENDOPLASMIC RETICULUM AND SMOOTH ENDOPLASMIC**

RETICULUM:

Characteristics	Rough ER	Smooth ER
Ribosomes	Attached to cisternae	Absent
Function	Protein synthesis	Steroid and lipid synthesis
Occurrence	Abundance in protein secreting cells like pancreatic cells, fibroblast, liver cells etc.	Abundance in lipid and sterol secreting cells like intestine cells, leucocytes etc.
Also known as	Granular ER	Agranular endoplasmic reticulum
Connection	Continuous with nuclear membrane	Continuous with Golgi complex and plasma membrane

E **MITOCHONDRIA AND CHLOROPLAST:**

Characteristics	Mitochondria	Chloroplast
Occurrence	All plants and animals except RBC's of mammals.	Only in plants
Site of	Aerobic respiration	Photosynthesis
Pigment	Colourless	Green in colour
Shape	Sausage or rod shaped	Disc shaped
Inner membrane	Forms cristae	Forms thylakoids or lamella
Exchange of gases	Intake of $O_2$and release of CO_2	Intake of $CO_2$and release of O_2
Function	Oxidation of food	Synthesis of food

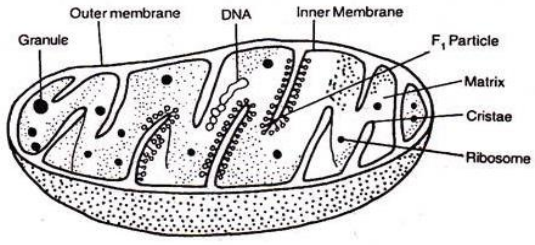


Fig. 1.19 (*a*) Mitochondrion cut open to show the inner structures.

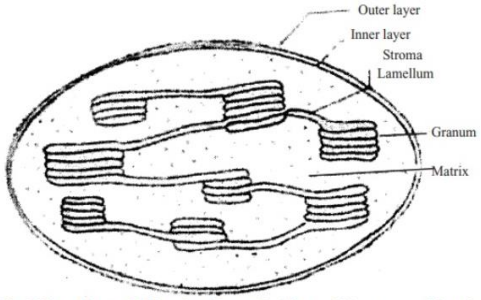


Fig : 2.3 :- Different Parts of Chloroplast (Seen under Electron Microscope and then simplifi

Question Answers

Pg. No. 59

Q.1 **Who discovered cells, and how? (To be discussed/marked)**

Ans In 1665, an English scientist named Robert Hooke discovered cells. He examined a thin slice of cork under a self-designed microscope and observed that the cork resembled the structure of a honey comb. Hooke named these tiny compartments as 'cells'.

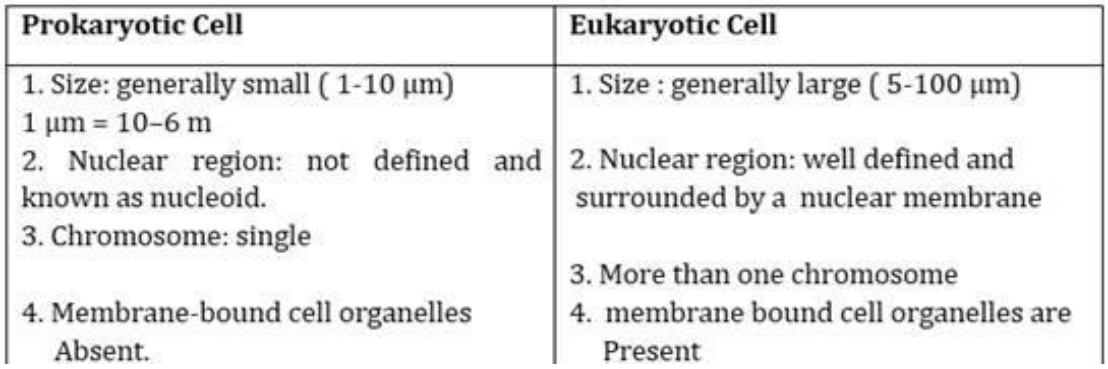
Q.2 **Why the cell is called the structural and functional unit of life?**

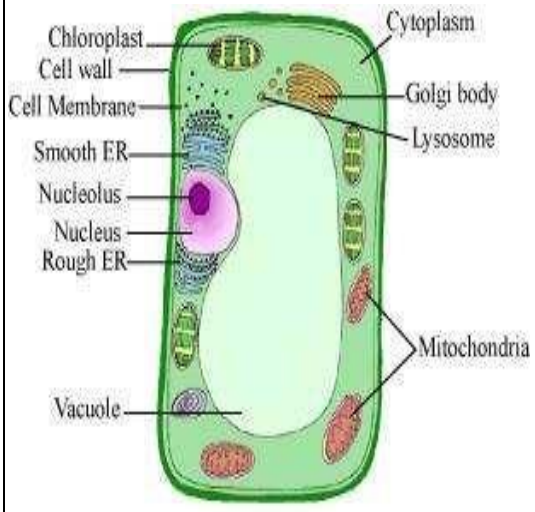
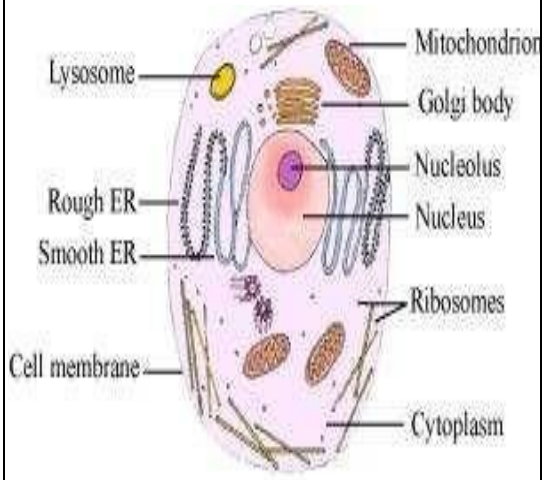
Ans All living organisms are made up of cells so cell is the basic building unit of a living organism and all the activities performed by a living organism are sum total of activities performed by its cells. All life processes take place in each cell i.e at cellular level. Hence, cell is called the structural and functional unit of life.

Pg. No. 61

Q.1 **How do substances like CO_2 and water move in and out of the cell? Discuss.**

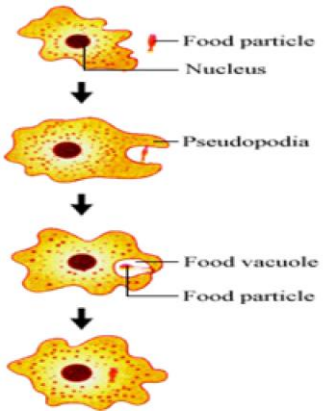
Ans The cell membrane is selectively permeable and regulates the movement of

.		substances in and out of the cell. Movement of CO_2: Diffusion is defined as the movement of a substance from a region of higher concentration to lower concentration. CO_2 is formed inside cell due to respiration and it accumulates in the cell so its concentration is high in the cell as compared to the surroundings. As a result CO_2 diffuses out of the cell. Similarly, O_2 enters the cell by the process of diffusion when the concentration of O_2 inside the cell is low as compared to its surroundings Movement of water: Water moves by osmosis from region of its higher concentration to lower concentration through semi permeable membrane.
Q.2		**Why the plasma membrane is called a selectively permeable membrane? (To be discussed/marked)**
Ans		Plasma membrane is a highly specific structure. It is made up of lipids and proteins, which selectively allows the entry of substances into cell and exit of some other substances from the cell i.e. selectively permeable.
		Pg. No. 63
Q.1		**Fill in the gaps in the following table illustrating differences between prokaryotic and eukaryotic cells. (To be discussed/Marked)**
Ans		
		Pg. No. 63
Q.1		**Can you name the two organelles we have studied that contain their own genetic material?**
Ans		Chloroplasts and Mitochondria.
Q.2		**If the organisation of a cell is destroyed due to some physical or chemical influence, what will happen?(To be discussed/marked)**
Ans		If the organisation of a cell is destroyed due to some physical or chemical influence then such cell would not survive any more as all components of that cell are digested up by its lysosomes.
Q.3		**Why are lysosomes known as suicide bags?**
Ans		Lysosomes are cell organelles filled with hydrolytic (digestive) enzymes. When a cell is damaged, its lysosomes may burst out and its enzymes digest up its own cell. Due to this, we can say that lysosomes are suicide bags.
Q.4		**Where are proteins synthesised inside the cell?**
Ans		Ribosomes are the site for protein synthesis. Ribosomes are very small structures found either in a free state, suspended in the cytoplasm, or attached to the surface of the endoplasmic reticulum. They are composed of ribonucleic acids and proteins.
		Chapter – end
Q.1		**Make a comparison and write down ways in which plant cells are different from animal cells.**
Ans		

Plant Cell	Animal Cell
Plants cells are usually larger than animal cells.	Animal cells are generally small in size.
Cell wall is present.	Cell wall is absent.
Plastids (Chromoplasts and leucoplasts) are present.	Except the protozoan *Euglena*, no animal cell possesses plastids.
Vacuoles are larger in size and central	Vacuoles are smaller in size.
Centrosome absent	Centrosome present
Lysosome absent	Lysosome present
Cytoplasmic division by cell plate formation	Cytoplasmic division by cell furrow formation
 Plant cell	 Animal cell

Q.2 How is a prokaryotic cell different from a eukaryotic cell?

Prokaryotic cell	Eukaryotic cell
Most prokaryotic cells are unicellular.	Most eukaryotic cells are multicellular.
Size of the cell is generally small (0.5-5 µm).	Size of the cell is generally large (50-100 µm).
Nucleus primitive	Nucleus advanced
It contains a single chromosome.	It contains more than one chromosome.
Nucleolus is absent.	Nucleolus is present.
Membrane-bound cell organelles such as plastids, mitochondria, endoplasmic reticulum, Golgi apparatus, etc. are absent.	Cell organelles such as mitochondria, plastids, endoplasmic reticulum, Golgi apparatus, lysosomes, etc. are present.
Cell division occurs only by mitosis.	Cell division occurs by mitosis and meiosis.
Prokaryotic cells are found in bacteria and blue-green algae.	Eukaryotic cells are found in fungi, plants, and animal cells.

		Ribosomes 70s type | Ribosomes 80s type
Q.3		**What would happen if the plasma membrane ruptures or breaks down? (To be discussed/marked)**
Ans		The rupture or break down of cell's plasma membrane indicates that cell is damaged and in such condition the lysosomes of the damaged cells may burst and the digestive enzymes present inside those lysosomes would digest their own cell. This will result into death of the cell.
Q.4		**What would happen to the life of a cell if there was no Golgi apparatus?**
Ans		If there was no Golgi apparatus in the cell, then most activities performed by the Golgi apparatus will not take place. (i) Storage, modification, and packaging of products will not be possible. (ii) The formation of complex sugars from simple sugars will not be possible as this takes place with the help of enzymes present in Golgi bodies. (iii) Formation of lysosomes, peroxisomes and acrosome of sperm will not occur. (iv) Formation of cell plate in plants during cell division will not occur.
Q.5		**Which organelle is known as the powerhouse of the cell? Why?**
Ans		Mitochondria of the cell are known as the power house of the cell because they synthesize energy in the form of ATP molecules during respiration which is vital for various life activities.
Q.6		**Where do the lipids and proteins constituting the cell membrane get synthesised?**
Ans		Endoplasmic reticulum is responsible for synthesis of lipids and protein constituting membrane. The endoplasmic reticulum is of two types: i) Smooth endoplasmic reticulum (SER): It is responsible for the synthesis of lipids constituting cell membrane. ii) Rough endoplasmic reticulum (RER): It bears the ribosomes and is therefore responsible for the synthesis of proteins constituting cell membrane.
Q.7		**How does an *Amoeba* obtain its food?**
Ans		 Amoeba feeds on microorganisms (like planktons) which float on water. It develops false feet or pseudopodia to surround the food. It captures the food within a sac like structure called the food vacuole inside which digestion of food takes place.
Q.8		**What is osmosis? (To be discussed/marked)**
Ans		Osmosis is the movement of water (solvent) from a region of high water concentration to a region of low concentration of water, through a semi permeable membrane. It can take place only in liquid medium and not in solid or gases. Example is absorption of water from soil by plant roots.
Q.9		**Carry out the following osmosis experiment: Take four peeled potato halves**

		and scoops each one out to make potato cups. One of these potato cups should be made from a boiled potato. Put each potato cup in a trough containing water. Now, **(a) Keep cup A empty** **(b) Put one teaspoon sugar in cup B** **(c) Put one teaspoon salt in cup C** **(d) Put one teaspoon sugar in the boiled potato cup D.** **Keep these for two hours. Then observe the four potato cups and answer the following: (To be discussed/marked)**
	(i)	**Explain why water gathers in the hollowed portion of B and C.**
Ans		When we put one teaspoon sugar in cup B and one teaspoon salt in cup C, hypertonic solution is formed inside the cups so water from outside enters inside the cup due to osmosis and collects in the hollowed portion of cups B & C.
	(ii)	**Why is potato A necessary for this experiment?**
Ans		Potato A in the experiment acts as a control set-up. No water gathers in the hollowed portions of potato A.
	(iii)	**Explain why water does not gather in the hollowed out portions of A and D.**
Ans		Water does not gather in the hollowed portions of potato A because potato cup A is empty. It is a control set-up in the experiment. Water is not able to enter potato D because the potato used here is boiled. Boiling kills the cells and denatures the proteins present in the cell membrane and thus, disrupts the cell membrane. For osmosis, a semi-permeable membrane is required, which is disrupted in this case. Therefore, osmosis will not occur. Hence, water does not enter the boiled potato cup.
		<u>Video Links for text book activities:-</u> **Activity-5.1, 5.2 & 5.7--**https://youtu.be/Twp381zHuTE **Activity-5.3 --**https://youtu.be/SSS3EtKAzYc **Activity-5.4 --**https://youtu.be/tN6Q4yEsdxs **Activity-5.5 --**https://youtu.be/GY9lfO-tVfE **Activity-5.6--**https://youtu.be/VPwLN6U1spk
		<u>Assignment for practice :-</u> 1) What is the difference between nucleus and nucleoid? 2) Give reason- During throat infection doctor advises us to gargle with salt solution. 3) What major difference will be observed in the cell of onion peel and the cheek cells while observing them under light microscope? 4) What is chromatin and chromosome? Where are they found in the cell? 5) Why does a plant cell generally not burst when kept in a hypotonic solution? 6) What is the relation between the osmosis and plasmolysis? 7) Name the three major functional components of the cell and mention their main functions. 8) What do you understand by selective permeability? 9) Why are the shapes and sizes of cells different in various body part of an individual of multi-cellular organisms? 10) Explain following terms-isotonic solution, cristae, grana, nucleolus, nucleoid, vesicles, leucoplast, organelles, chromatin, and endocytosis. 11) Draw labelled diagram of- animal cell, plant cell, Prokaryotic cell, nucleus, Mitochondria, cell membrane. 12) **Recognize me**- □ Gatekeeper of cell

		□ Main site of metabolism □ Control centre of cell □ Kitchen of cell □ Powerhouse of cell □ Workshop of cell □ Site of protein synthesis □ Suicide bag of cell □ Membrane-less organelle of cell □ Water reservoir of plant cell □ Software of cell □ Extra protective covering of plant cell

Cell- structural and functional unit of life

Body of organisms either made up of single cell or many cells. Thus organisms are unicellular or multi-cellular.
In multi-cellular organisms Cells are organized into tissues, organs and organ systems. Thus all the body parts are made up of cells.

All the metabolic or physiological activities are ultimately performed or facilitated by cells.
All the cells perform some similar activities like nutrition, respiration, excretion, interaction with environment etc. In unicellular organisms single cell is capable of performing all life activities.
If proper environment is provided than every/any cell is capable of performing life activities and living independently.

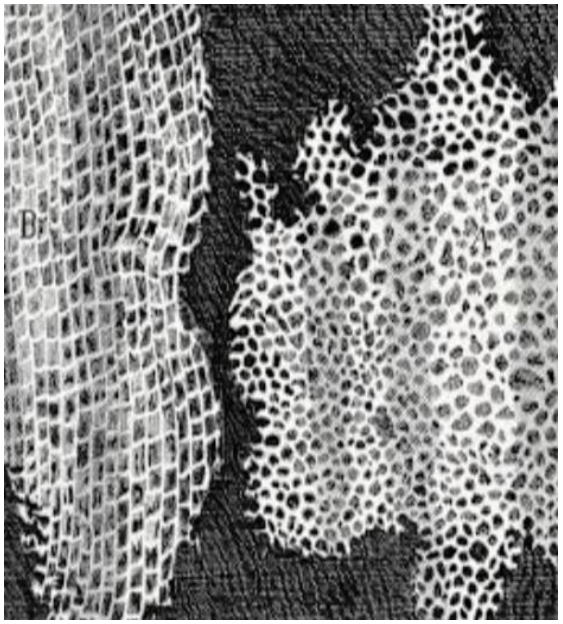
Cells contain genetic material which regulate cell functions and pass on all information to the next generation to produce similar type of individuals.
Life of every new individual starts with single cell.

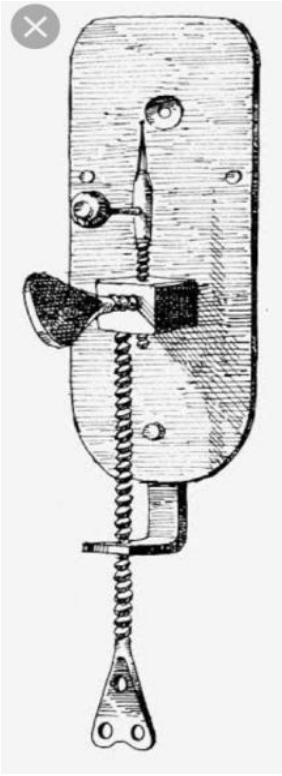
Anything less than cellular organization can't survive independently for long time (Ex-Virus). If physical or chemical structure of cell is damaged than the life will end.

Thus formation of body and body parts, functioning of body and formation of new generation are done by cells, hence it is considered as a fundamental unit of life.

History

Robert Hooke (1665) discovered and named the **cell** originated from Latin word **'cellula'** = small room.





Anton Von Leewenhoek in 1674 observed the **living cells of micro-organisms** in the drop of pond water through self maid microscope.

Robert Brown (1831) discovered and named the **nucleus** in plant cells.

Purkinje in 1839 gave the term **protoplasm** for the living fluid substance present inside the cell.

After observing and studying tissues and body parts of many plants and animals German biologist **Schleiden in 1838** and **Schwann in 1839** proposed the **cell theory**,

1) **All organisms are composed of cells.**
2) **Cells are the smallest structural and functional unit of all organisms.**

German physician **Rudolph Virchow in 1858** added one more postulate-

3) **Every cell or new cell arises from pre-existing living cell.**

This opened a new branch in the field of biology called **Cytology.** The Instrument used to study the cell - Microscope.

Light/compound microscope	**Electron microscope**
It uses glass lenses for magnification and beam of light to illuminate the object.	It uses magnetic lenses and beam of electrons instead of light to get magnified image.
Magnification power range from 300 to 1500 times.	Magnification is 100,000 to 500,000 times.

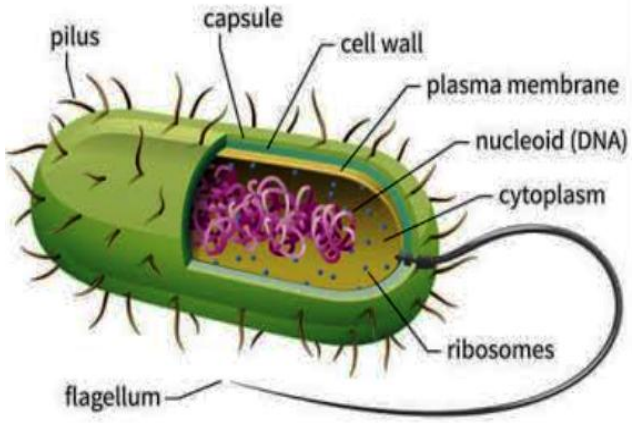
Basic common structure of cells

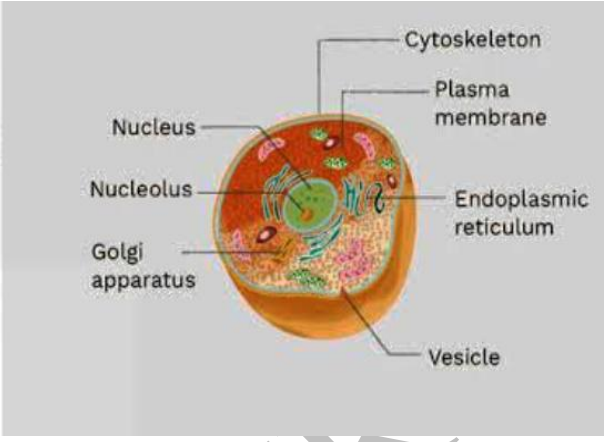
(1) **Outer limiting membrane**
(2) Control centre = **Nucleus** with genetic material.
(3) Inner content = **Cytoplasm** & organelles.

Viruses are called Non cellular organism as they have only genetic material and outer covering of protein, they lack other cellular structures and hence do not show characteristics of life until they enter in a living cell to use its machinery to reproduce.

Prokaryotic cell	**Eukaryotic cell**
Size of cell is generally small. (1-10 micrometer)	Size of the cell is comparatively large (10-100 micrometer)
Nuclear material is not surrounded by a nuclear membrane, thus well defined nucleus is absent, only single coiled DNA is present suspended at the centre of cell called nucleoid	Nuclear material is surrounded by a nuclear membrane, thus well defined nucleus with membrane, nucleoplasm, chromosomes (DNA), and structures like nucleolus etc are present.
Cell wall is present.	Cell wall may present or absent.

Membrane bound cell organelles are absent. Only ribosome are present, they are smaller in size.	Membrane bound cell organelles are present. ribosome are larger in size.





The shape & size of cell

In the body of single individual, as per different roll cell show different shapes and sizes.

Ex- In human body

Muscle cell- long cylindrical or spindle shaped.

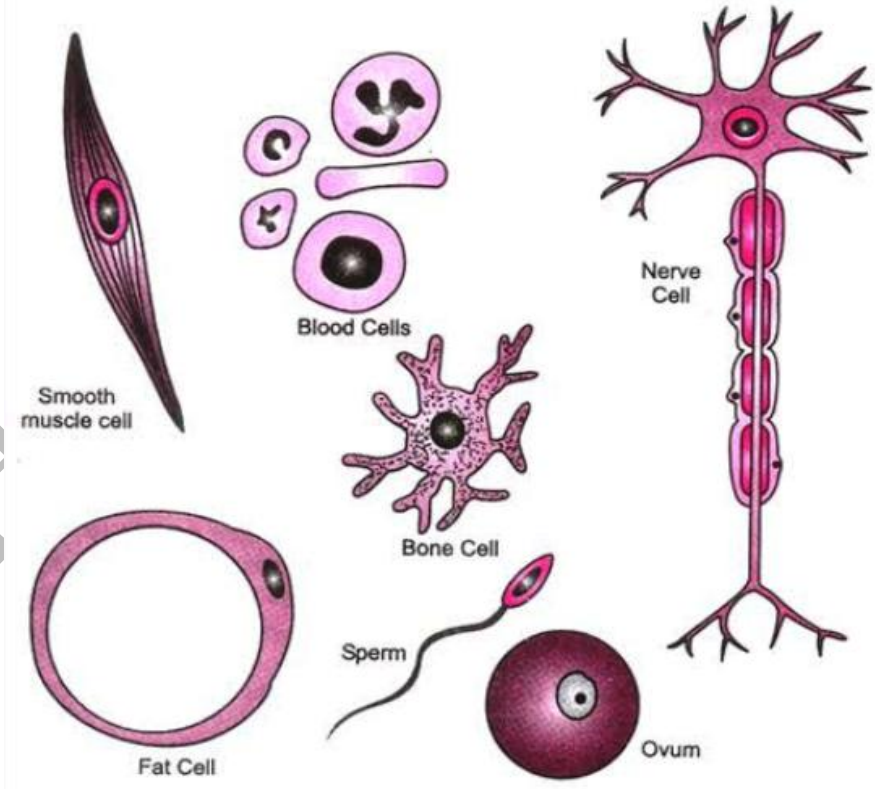
Nerve cell- long branched.

RBC- disc shaped.

WBC- irregular shaped.

Ovum-spherical.

Sperms-cone shaped with long tail.



Shapes and sizes are determined by the specific function of the cell. During its maturation a cell takes up specific shape and size, it remains unchanged till its death. There are some cells that show variable or irregular shape. Ex- amoeba and WBC.

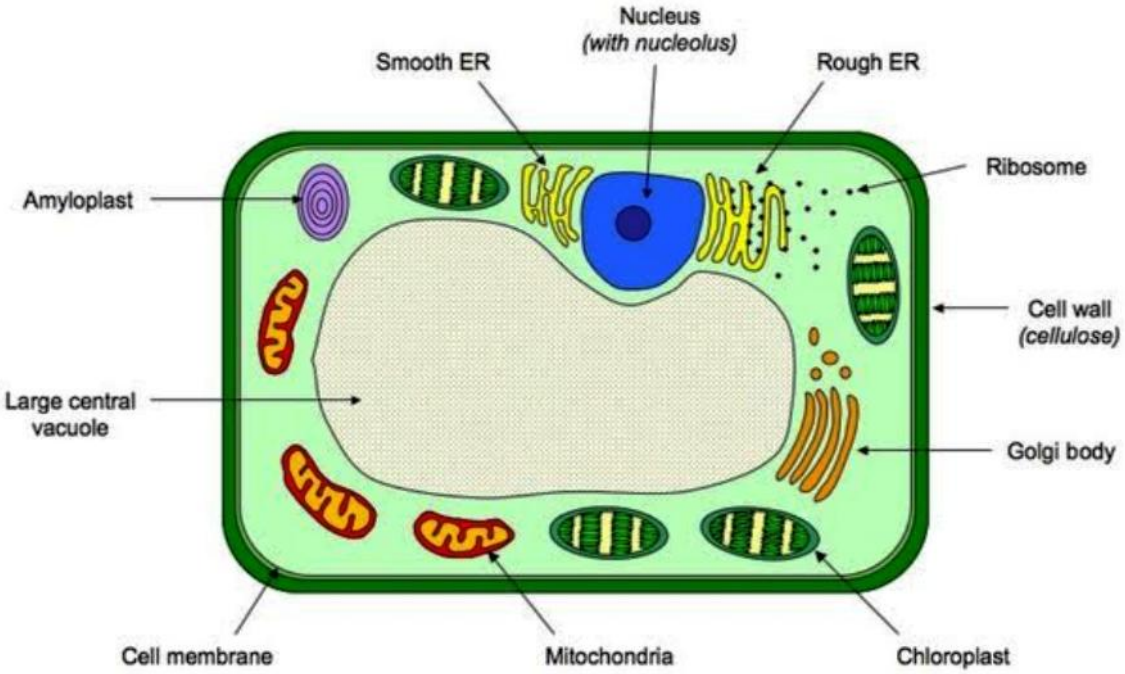
The size of cells varies from the very small micrometer scale to large up to meter. (1micro-meter = 10^{-6} meter)

Mycoplasma (PPLO) – The smallest cell (0.1micro-meter).

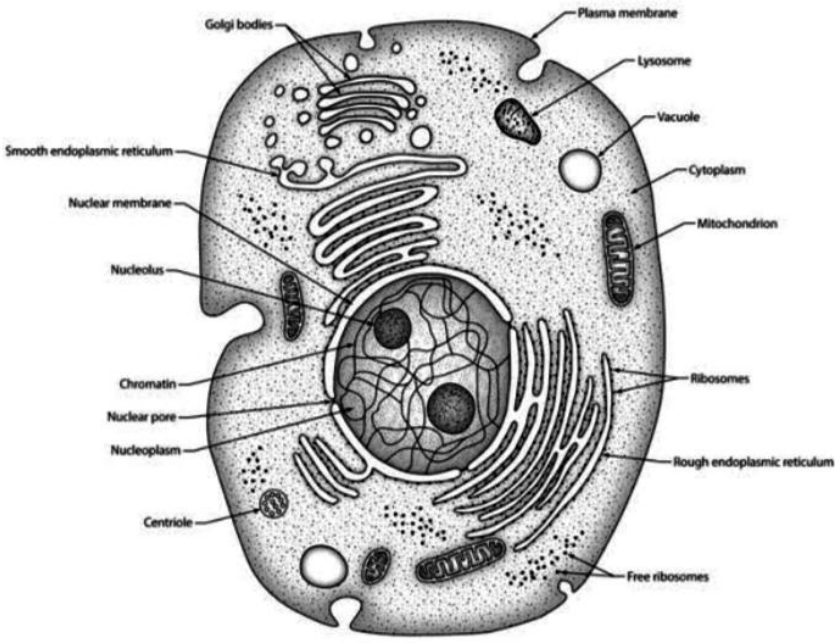
Ostrich egg- The largest cell (15cm long & 13cm wide).

Nerve cell & cells of conductive tissue in big trees may have length 50-90cm .

Plant cell



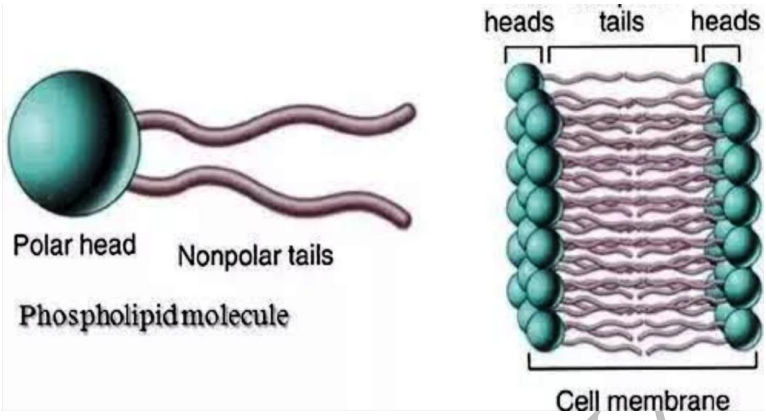
Animal cell



Plant cell	Animal cell
Plant cells are larger than animal cells.	Animal cells are generally small in size.
Non living, rigid cell wall outside the plasma membrane.	Cell wall absent
Chloroplast present for photosynthesis.	Chloroplast absent
Most mature plant cells have a large central vacuole.	Vacuoles in animal cells are many, small and temporary.
Its nucleus is often pushed to one side in the periphery	Its nucleus is generally near the centre.
Plant cells lack centrosome	Centrosome present

The plasma membrane is the outer covering of each cell. It is a living, thin, delicate, elastic boundary of cell.

It provides a shape to the cell and it separates and protects the inner contents of the cell from outer environment.



It is a selectively permeable membrane because it allows the entry or exit of the substances as per the requirement.

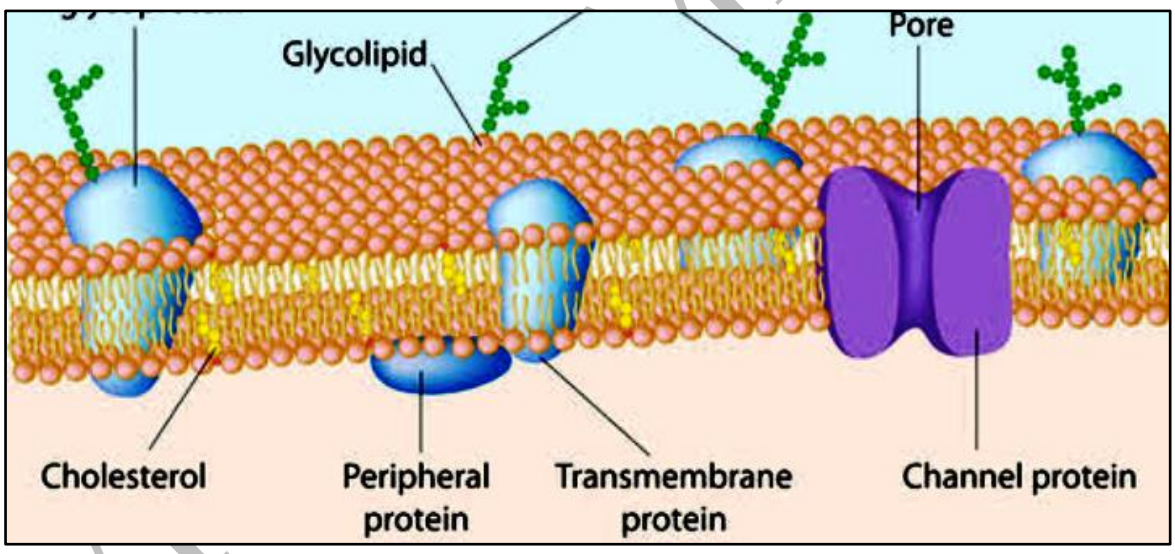
It is made up of phospholipids bi-layer along with proteins and polysaccharide .

As per the place in the phospholipids bi-layer protein molecules are of 2 types.

1) Surface/peripheral protein

2) Trans membrane/integral protein -embedded within lipid bi-layer.

This arrangement forms mosaic appearance and all the molecules show free lateral movement so it is considered as a fluid. Thus cell membrane is called fluid-mosaic structure.



Transport through plasma membrane

Active	Passive
Done by the use of energy.	Done without the expenditure of energy.
Substances are carried From their lower to higher Concentration.	Substances are carried from their higher to lower concentration.
Done with or without the help of of membrane proteins.	Always done with the help of membrane proteins.

Passive Transport

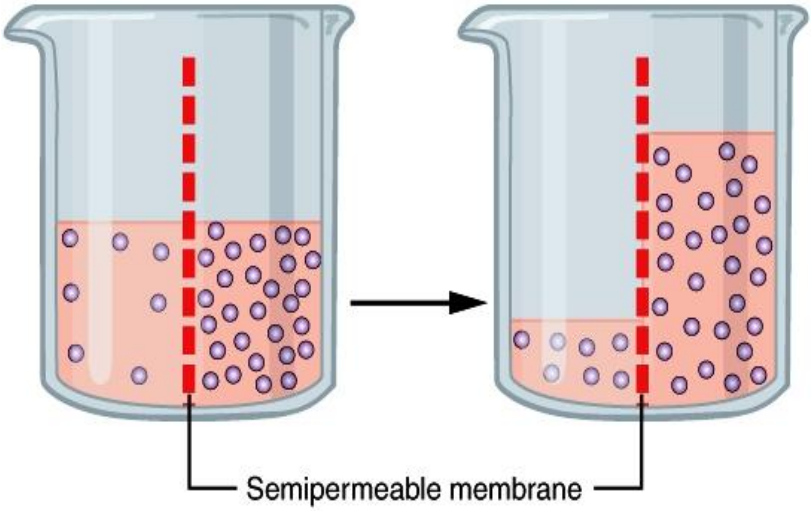
- Diffusion — Gases like O_2&CO_2
- Osmosis — Diffusion of Water
- Facilitated diffusion — Larger molecules & ions (Diffusion through channel proteins).

Osmosis- diffusion of water through semi-permeable membrane
Solution= solvent + solute

1) Hypertonic - comparatively more concentrated

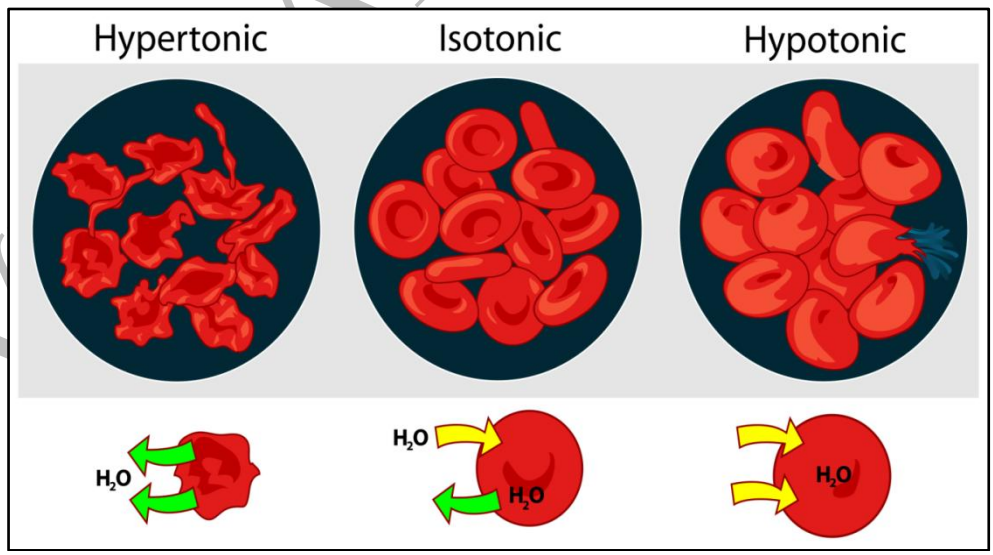
2) Hypotonic - comparatively less concentrated

3) Isotonic - solutions with same concentration.



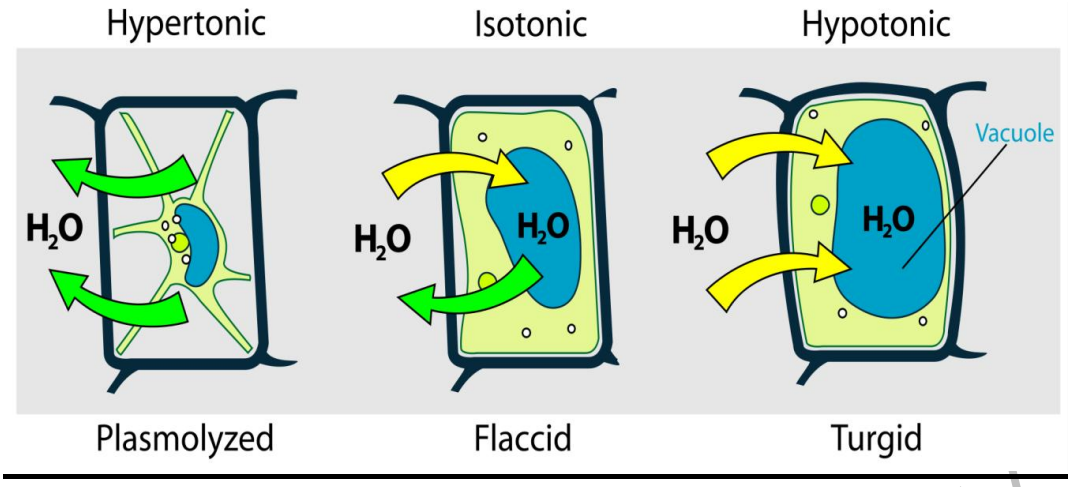
Osmosis

- **Endosmosis** — From outside to inside
- **Exosmosis** — From inside to outside



Plasmolysis

When a living plant cell loses water through exosmosis, the inner contents of the cell shrinks at one place or corner. This phenomenon is known as plasmolysis. Such cell is called plasmolysed cell. The reverse process is called deplasmolysis.



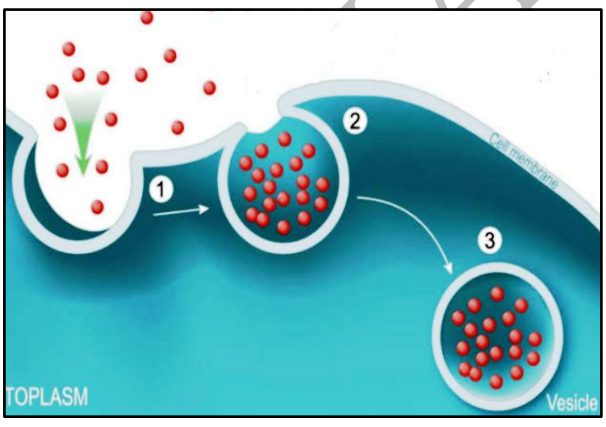
Diffusion	**Osmosis**
Movement of any substance (solid, liquid, gas) from area of higher concentration to lower concentration. Presence of Semi permeable membrane is not necessary.	Movement of solvent (water) molecules from area of higher concentration to lower concentration through semi permeable membrane.

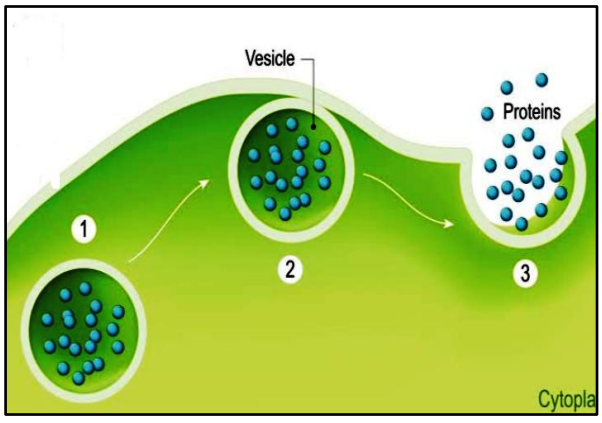
Bulk Transport through plasma membrane

It is an active transport done by membrane bounded vesicles.

Endocytosis
Substances are carried inside the cell in a large bulk.

Exocytosis
Secretion & excretion





Cell wall

It is non-living layer present outside the plasma membrane in all plants, fungi and prokaryotic cells.
Mostly freely permeable, sometimes non- permeable.
Mostly tough & rigid, sometimes flexible.

Plant cell wall - **Cellulose**, pectin, lignin, suberin, cutin, etc.
Algal cell wall - **Cellulose**, calcium & silica compounds.
Fungal cell wall - **Chitin**.
Cell wall of prokaryotes - **Peptidoglycan, glycoprotein**, silica.

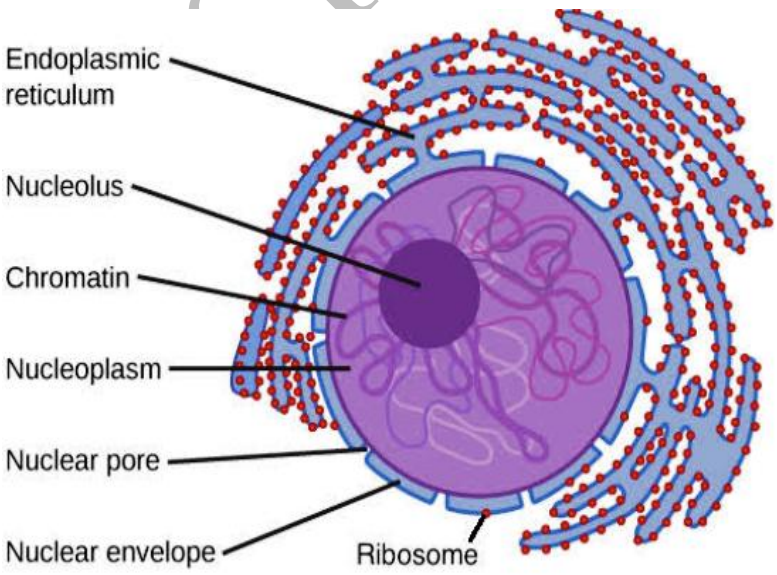
Functions

Strength & Protection-It provides mechanical strength and shape to the cell.
It **protects the cell against pathogens, mechanical injury and environmental variation** (Ex- temperature variation).
It also prevents excess evaporation of water and bursting of cell by endosmosis. (When water enters living cell, the protoplasm swells up and builds pressure against the cell wall. The cell wall exerts equal and opposite pressure against the swelling protoplasm. As a result further entry of water inside the cell is stopped).

Cell wall	**Plasma membrane**
It occurs in plants, fungi and prokaryotes.	Present in all cell in all types of organisms.
It is nonliving and rigid	It is living and flexible.
Generally permeable, sometimes non- permeable.	It is selectively semi-permeable.
It is formed of cellulose, hemi cellulose and pectin.	Formed of lipids, proteins and small number of carbohydrate.
Its functions are protection and strength.	Its functions are to hold cellular contents and control passage of materials.

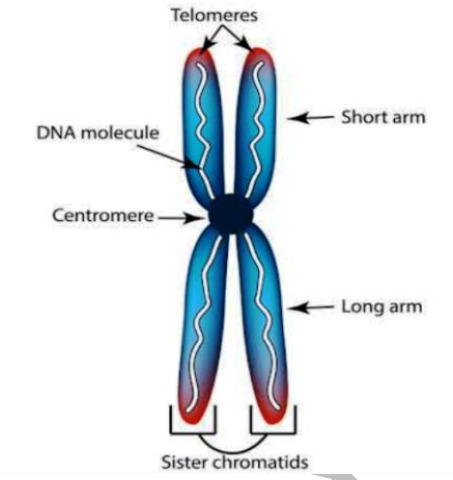
Nucleus

Centrally located, mostly spherical & largest organelle.



Nuclear membrane-double layered envelope separates the nuclear content from the cytoplasm.
Nucleopore-Many pores are present on it, they allow selective transfer of materials between the nucleoplasm and the cytoplasm.
Nucleoplasm- Fluid content of nucleus contains enzymes, RNA, proteins, ions, water etc.

Nucleolus-A dense spherical structure involved in the formation of ribosome.
Chromatin- it is a thread like mass of DNA.
It stores all the information necessary for the cell to function, to grow and to reproduce.
The chromatin coils into condensed thick rod like chromosomes during the division of cell.
Cell that lack the nucleus.
RBC of mammals, this enables them to carry more hemoglobin and so take up more oxygen.
In plants phloem sieve tube cells which provide the transport system for sugar.



Functions

It controls all metabolic activities of the cell. If the nucleus is removed from a cell, the cell dies.
Heredity-DNA is responsible for the transmission of traits from the parent to offspring. Important components like ribosome and RNA produced in the nucleus.

Cytoplasm

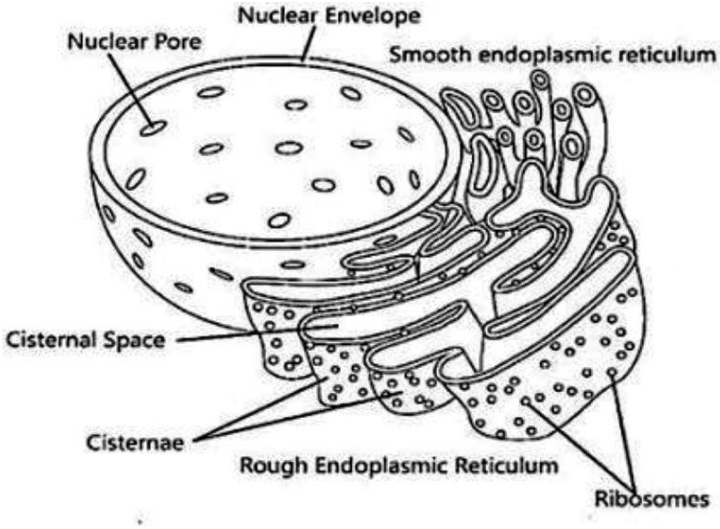
Cytoplasm = everything except PM & nucleus.
The part of the cell which occurs between the plasma membrane and nuclear envelope is called the cytoplasm.
Cytoplasm consists of liquid or jelly ground matter called- cytosol and variety of cell organelles. Cytosol contains water, ions, enzymes, protein, lipid, carbohydrates, sugar, amino acids, nucleic acid, waste substances etc.

Functions

It acts as a storage area of vital chemicals.
It is the site of most metabolic processes.
It gives support to the shape to the cell and organelles.

Cell organelles-Endoplasmic reticulum (ER)

It is large network of membrane bound tubes and flat sacs.
On the one end ER is connected to the outer membrane of nucleus and on the other end to the plasma membrane. The ER is absent in the RBCs of mammals.



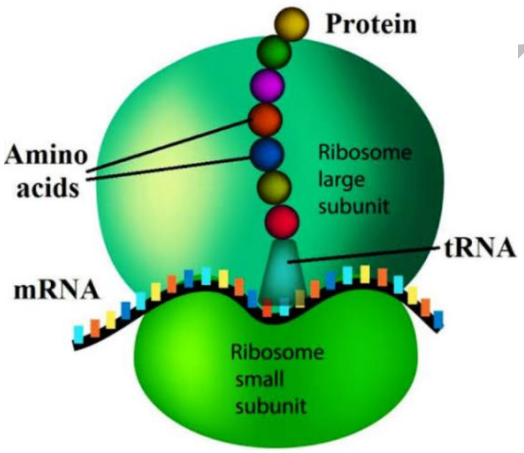
It is of two types-

1) Rough endoplasmic reticulum (RER) - region near the nucleus ribosome are attached on its surface.
2) Smooth endoplasmic reticulum (SER) - without ribosome.

Functions

It forms supporting skeletal framework of the cell.
It provides a pathway for the intra cellular transport between various regions.
It also acts as a temporary storage site for many substances.
All proteins are produced on the surface of RER.
Lipids are synthesized by SER.
Components of plasma membrane and other cellular membranes are synthesized by ER which is called- **membrane bio-genesis.**
SER of liver cell of vertebrates is involved in the process of detoxification. In the muscle cell ER help in the contraction.
In hormonal glands SER synthesizes hormones. Vesicles are formed from the surface of ER to transport the substances.

RER	**SER**
Contains flat sacs called cisternae.	Mainly formed of vesicles and tubules.
Ribosomes are attached to its outer surface.	It doesn't contain ribosome.
It is specialized to synthesize proteins.	It is specialized to synthesize lipids



Ribosome

Ribosomes are spherical or granular particle like structures present in both prokaryotic and eukaryotic cells except mammalian RBC. They occur freely in the matrix or attached to the RER.
Made up of RNA (ribonucleic acid) and proteins.They are not bounded by membrane.
Each has two sub units- larger & smaller, which join together and work as one. **Function-** Synthesis of proteins

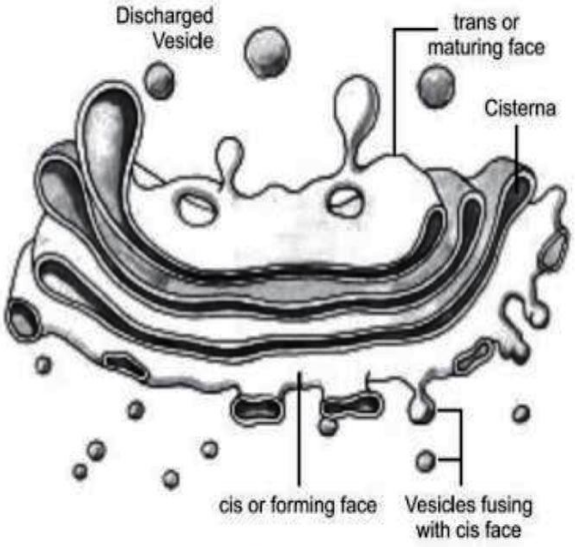
Golgi Apparatus /Body /Complex

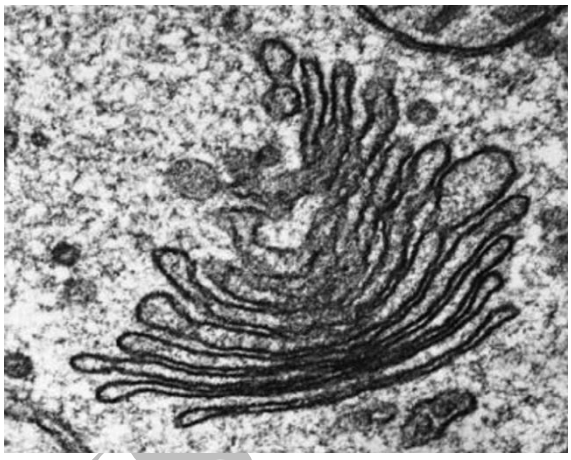
Golgi apparatus consists of a bunch of membrane bounded fluid filled discoid sacs called cisternae near the nucleus.
Many vesicles and tubules are found on the surface or edge of cisternae.

Mostly it has two faces or sides- the concave side is facing to the nucleus, it is a receiving side, substances enter in the body by merging vesicles. This face is called sis-face.

The convex side is facing to the ER, it is a dispatching side, substances are sent from the body by emerging vesicles. This face is called trans-face.

Golgi apparatus is absent prokaryotes, mature sperms and RBC of mammals.



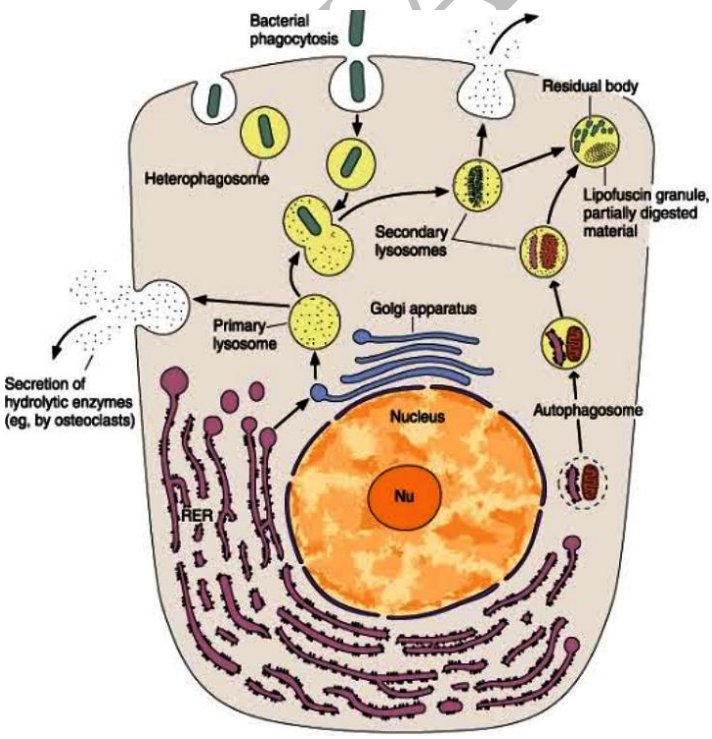


Functions

The main function of the Golgi apparatus is storage, modification and secretion (dispatching). Lysosomes are also formed from it.

Lysosomes

Lysosomes are small vesicles surrounded by a single membrane and contain concentrated digestive enzymes. These enzymes are capable of digesting or breaking down all organic materials. They remain distributed in the cytoplasm.



Functions

Defense-They destroy pathogens which enters the cell like bacteria and virus.

Digestion- It performs intracellular digestion of food. Also does extracellular digestion -ex. enzymes secreted by sperm make entry in the wall of ovum.

Cleaning-They remove worn out and poorly working cellular organelles by digesting them.

Removal of unwanted cells- dead cells are removed and even alive cells are removed during metamorphosis (tadpole

to frog), it is done by autophagy (destruction of self cell). So it is called the suicide bag of cell.

Mitochondria

The mitochondria are capsule or sausage shaped organelles, distributed in the cytoplasm. Each mitochondria has a double membrane envelope.

Outer membrane is porous. The inner membrane is infolded. These folds are called cristae, they provide much more surface area for biochemical activities.

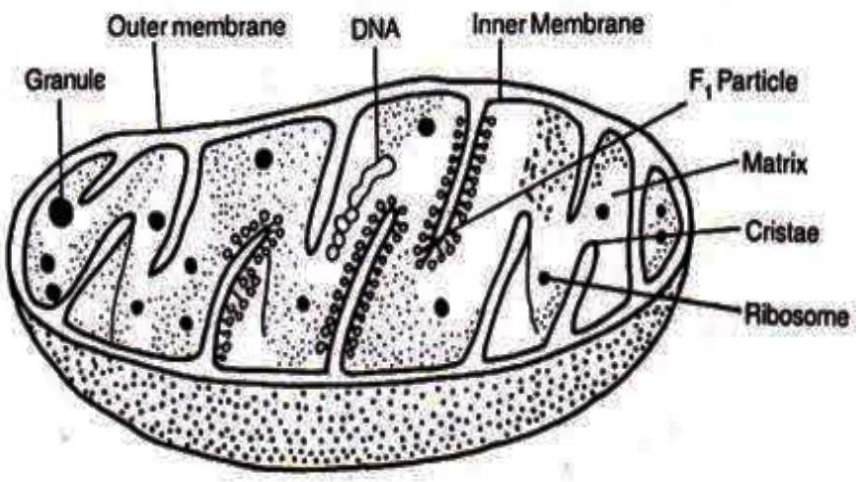
Many spherical bodies present in the surface of cristae known as oxysomes. They are related with synthesis of ATP.

The interior cavity of the mitochondria is filled with a matrix which contains enzymes, ribosome, DNA, RNA, proteins, phosphate ions etc.

Mitochondria are absent in bacteria and the RBC of mammals. Mitochondria is called semiautonomous organelle as it can make its own proteins.

Functions

Mitochondria are sites of cellular respiration by oxidation of carbohydrate. They synthesize energy rich compounds ATP, so they are known as 'Power house' of the cell. The energy stored in ATP is used by the cell therefore ATP is known as energy carrier or energy currency of the cell.



Plastids

Plastids occur in most plant cells, algae and some protists (unicellular aquatic organisms) and are absent in animals.

Like the mitochondria, the plastids also have their own DNA and ribosome.

Plastids are of following three types:-

1) Chloroplast- Green coloured plastids containing chlorophyll, Perform photosynthesis.

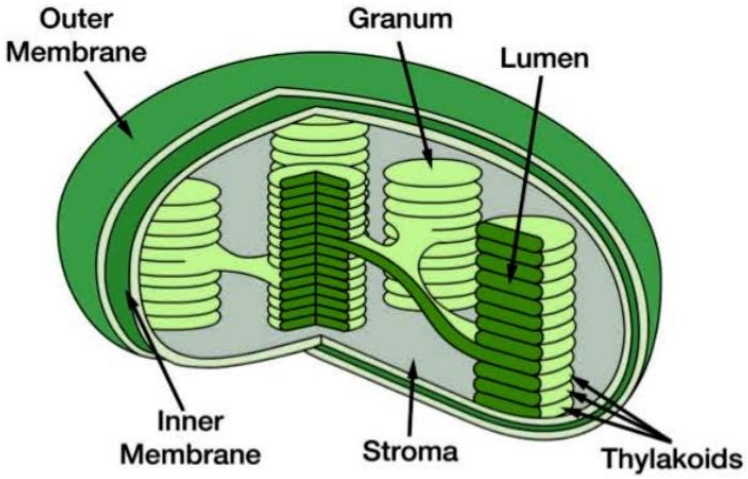
2) Chromoplast- Plastids contain coloured pigments except green coloured chlorophyll. They give colour to fruits, flowers and seeds.

3) Leucoplasts- The colourless plastids that act as storage of various substances.

- Amyloplast — Storage of starch
- Alleuroplast — Storage of proteins
- Elaioplast — Storage of fat

Chloroplasts

Chloroplasts are present in green algae, some protists and most of the higher plants. They have the green pigment called chlorophyll and they are involved in the photosynthesis. So chloroplasts are referred as the kitchens of the cells.
Each chloroplasts is bounded by two membranes.
Inner lumen contains-
(a) Grana- Bunches of discoid structures containing chlorophyll. Each disc shaped structure is called thylakoid.
(b) Stroma- The fluid matrix surrounding the grana. It contains a variety of enzymes, starch grains, DNA, ribosomes, proteins etc.



Functions- Chloroplasts trap solar energy and manufacture food for the plant.

Mitochondria	Chloroplasts
Present in both plant and animal cells.	They occur in the photosynthetic organisms.
They are colourless.	They are green in colour.
Inner membrane of mitochondria has infolds called cristae.	Their inner membrane forms discoid structures called thylakoids.
They perform oxidation of food and liberate energy.	They synthesize food and trap solar energy.

Chloroplasts	Chromoplasts
They are green plastids	They are non green coloured plastids.
They contain chlorophylls and carotenoids.	They contain only carotenoids.
Thaylakoid system is present.	Thaylakoid system is absent.
They perform photosynthesis.	They give colour to the organs.

Vacuoles

Vacuoles are fluid or solid filled and membrane bounded bodies. They are kind of storage and transportation sacs. They are small and temporary in animal cells. In plant cells, the vacuoles are larger and permanent.

In mature plant cells the single central vacuole occupies large volume of the cell, which mainly contains water, sugar, minerals etc. it's membrane is called tonoplast.

Functions

Water level (turgidity) & shape of plant cell - Vacuoles help to maintain balance of water inside the cell, due to the osmotic pressure from inside shape of cell is maintained.
Excretion -They store the waste for the future removal.
Storage- It stores a no. of substances.

Centrosome

IT is found only in animal cells.
It is not bounded by any membrane but consists of two cylindrical components made up of microtubules and situated perpendicular to each other. They are called centrioles. They also form cytoskeleton and structures like cilia and flagellum.

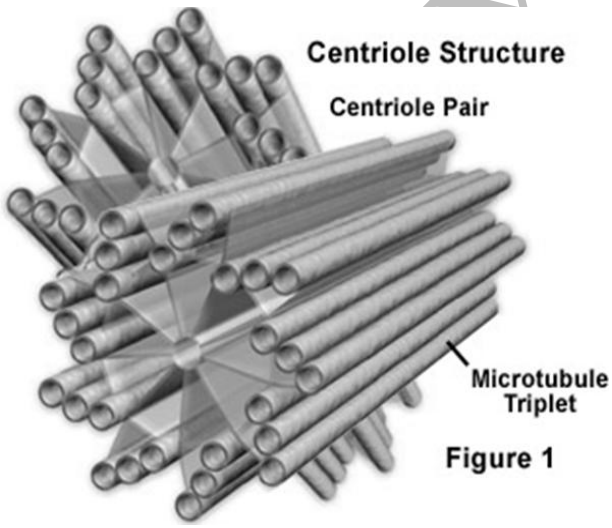


Figure 1

Functions

During cell division centrioles migrate to the opposite poles of the cells and form the spindle fibers. In plant cells, polar caps form the spindles.

Cell Division

The process by which new cells are made from pre-existing cells is called cell division. Many cells in the body keep on dividing and add new cells.
(i) So the growth occurs.
(ii) Old, dead and injured cells are replaced (renovation).
(iii)During sexual reproduction gametes are formed.
There are two main types of cell division:

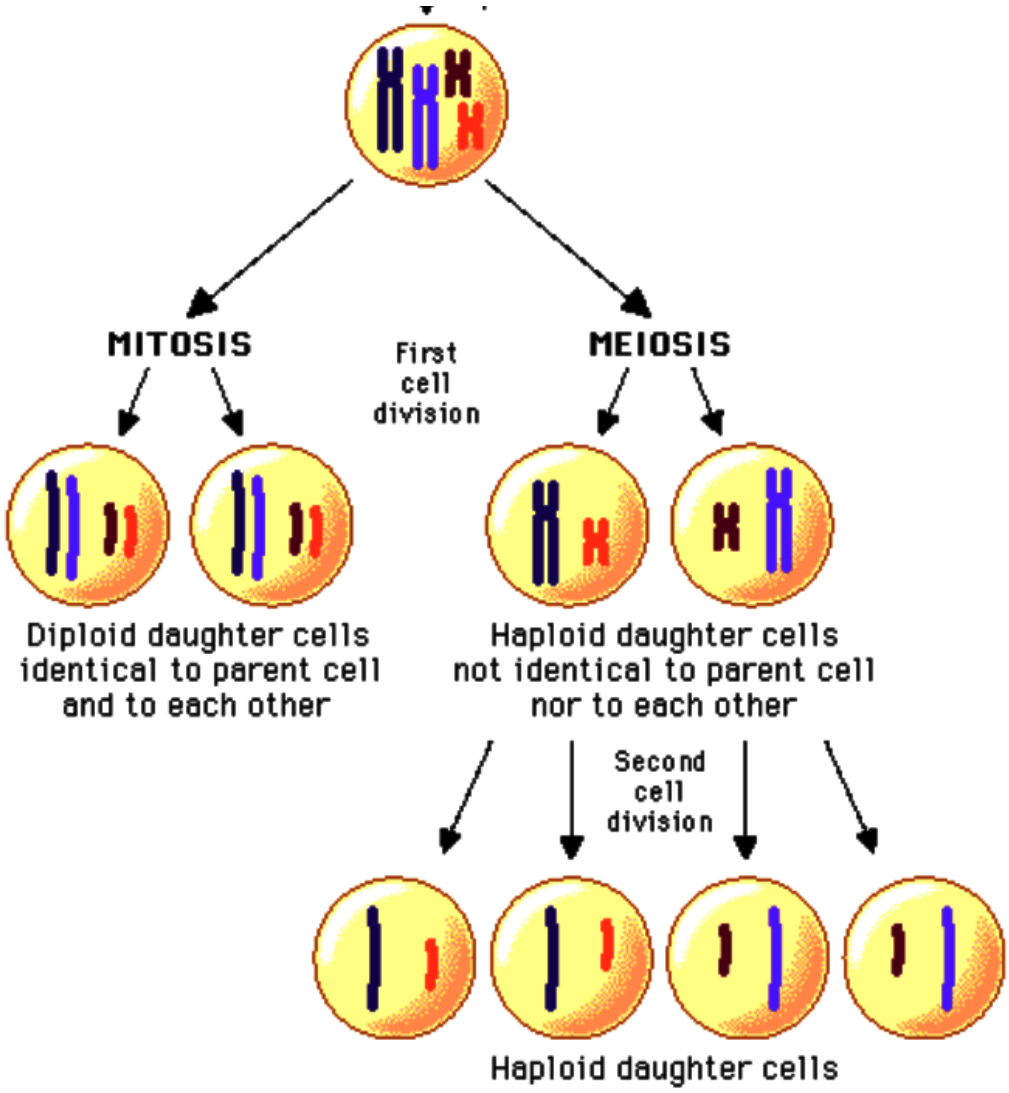
1) Mitosis = equational cell division.

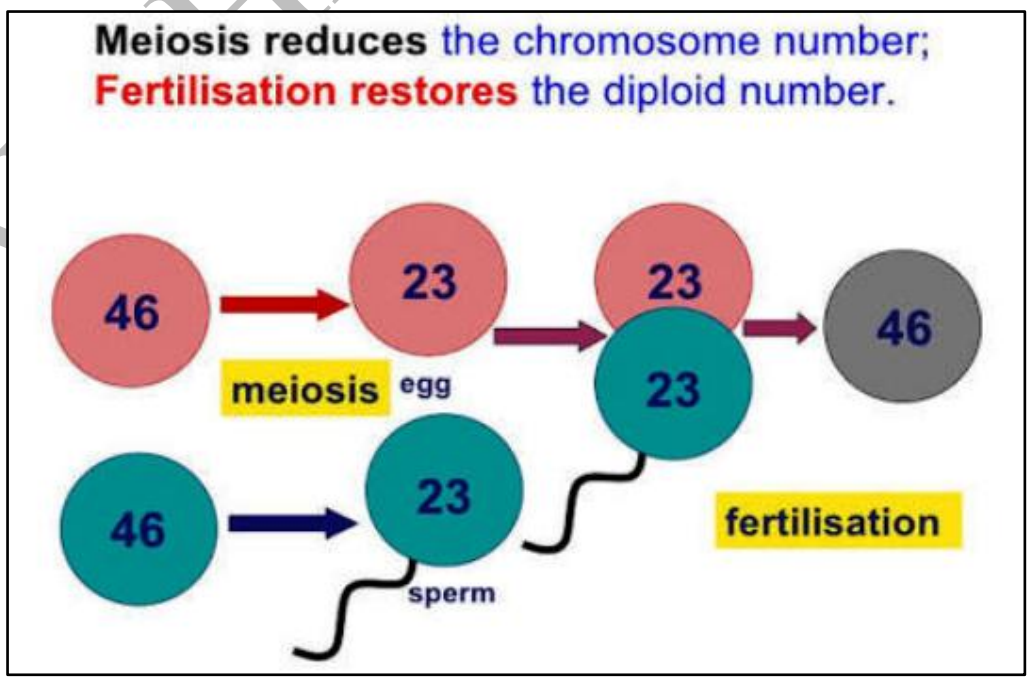
The cell division by which most of the cells divide for growth and renovation is called mitosis. In this process, each cell called mother cell divides to form two identical daughter cells. The daughter cells have the same number of chromosomes as mother cell.

2) Meiosis = reductional cell division.

Specific cells of reproductive organs or tissues divide to form gametes. They divide by a different process called meiosis which involves two consecutive divisions. When a cell divides by meiosis it produces four new cells instead of just two.

The new cells (gametes) only have half the number of chromosomes than that of the mother cells. After fertilisation gametes give rise to offspring in which original chromosome number is restored.





DPS GANDHINAGAR
ACADEMIC YEAR: 2020-21
CLASS IX: SCIENCE (PHYSICS)
CHAPTER-8: MOTION

QUESTION-ANSWER

1) What do you mean by the term 'Kinematics'?

- It is the branch of physics which deals with the **motion without its causes**.

2) Define motion. Give types of motion with suitable example.

- When an object changes its **position** with respect to **time** then that object is said to be in motion.
- **Types of motion:**
  - ✓ **Linear Motion:** a car moving on the straight road
  - ✓ **Circular Motion:** the earth revolves around the sun
  - ✓ **Rotational Motion:** a playing top spins around its axis
  - ✓ **Oscillatory Motion:** to and fro motion of a pendulum of a wall clock
  - ✓ **Projectile Motion:** the motion of a football when it is kicked from ground.

3) Explain the statement: "Rest and motion of an object are relative of each other."

- When an object is said to be in rest then it will be not in motion. Also when an object is said to be in motion then it will be not in rest. Therefore, Rest and motion of an object are relative of each other.

4) Explain the statement: "No absolute motion and rest is possible."

- Rest and motion are always relative. For example, two persons sitting in a moving bus are at rest with respect to each other but are in motion with respect to a person standing on the roadside. Further, trees, buildings, etc. on the surface of the Earth appear to be at rest but in fact they are in motion as the Earth revolves around the Sun. Thus, there is no object which can be considered to be at absolute rest. Hence, rest and motion are relative terms.

5) Differentiate the terms 'Reference point' and 'Reference frame'.

- **Reference Point:** It is a **point or place** in a **reference frame** from where an observer takes an observation.
- **Reference Frame:** The **Reference frame** can be any **area (2 Dimensional)** or **space (3 Dimensional)** from where the observer takes an observation of any body from any reference point whether it is in rest or motion.

6) Define: (a) Scalar Quantity (b) Vector Quantity

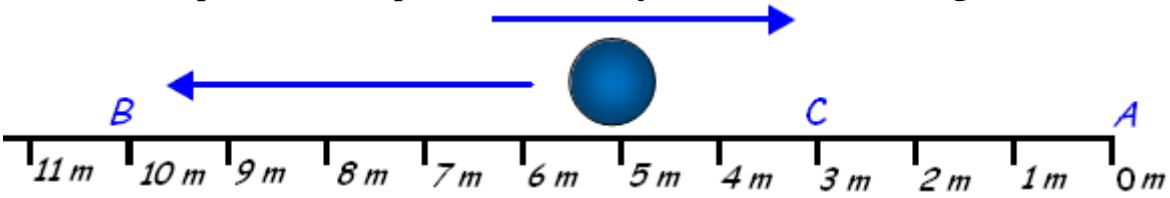
- **Scalar quantity:** The quantity which requires only **magnitude** with no direction.
- **Vector quantity:** The quantity which requires both **magnitude** and **direction**.

7) Give three differences between distance and displacement.

No.	Distance	Displacement
1.	Total length of a path travelled by an object during motion.	Shortest distance between initial point and final point of an object during motion.
2.	It is a scalar quantity.	It is a vector quantity.
3.	It is always positive.	It can be positive, negative or zero.
4.	It is greater or equal to displacement.	It is lesser or equal to distance.

8) An object has moved through a distance. Can it have zero displacement? If yes, support your answer with an example. (In-text Q.1 Pg.No.100)

- **Yes**, zero displacement is possible if an object has moved through a distance.

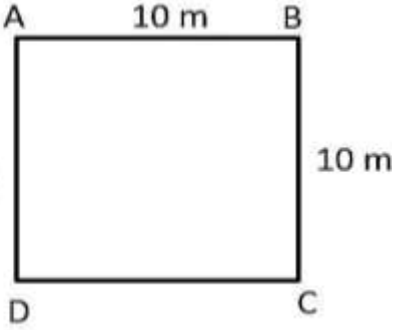


- Suppose a ball starts moving from point **A** and it returns back at same point **A**, then the distance will be equal to 20 meters while displacement will be zero.

9) A farmer moves along the boundary of a square field of side 10m in 40s. What will be the magnitude of displacement of the farmer at the end of 2 minutes 20 seconds from his initial? (In-text Q.2 Pg.No.100)

Length of square field = 10 m

Time taken to move along square field = 40 s



Total time the farmer walked on the square field

= 2 min 20 sec

= 2 × 60 + 20 (1 min = 60 s)

= 120 + 20

= 140 s

Total distance covered 10m in 40sec

Total time taken= 2min 20sec= 140sec

Total round completed = 140/40=3.5 rounds

$AC^2 = AB^2 + BC^2$

$= (10)^2 + (10)^2$

$=100+100$

$= 200$

Therefore, AC= $\sqrt{200}$

$= \sqrt{2} \times \sqrt{100}$

$= 10\sqrt{2}$ m

$= 10 \times 1.41$

$=14.1$ m

10) Which of the following is true for displacement?(In-text Q.3 Pg.No.100)

(a) It cannot be zero. - **False**

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

11) Define speed. Give its SI unit

- The **distance** travelled by an object in **unit time** is called **speed**. **SI unit:** m/s

12) What is the reason behind to take an average speed of a moving object?

The reason behind to take an average speed of a moving object is when an object performs Non-uniform motion.

13) An athlete completes one round of a circular track of diameter 200 m in 40 s. If he continues to run, what will be the distance covered and the displacement at the end of 2 minutes 20 s respectively? (Exercise. Q.1)

R = diameter/2 =200/2 = 100 m

Time for 1 round = 40 seconds

Total time for whole journey = 140 seconds

No. of rounds completed by an athlete = 140/40 = 3.5 rounds

So, distance = $3.5 \times 2\Pi R = 7\Pi R = 7 \times 22/7 \times 100 = 2200$ m

Now, displacement = diameter = 200 m

14) Abdul, while driving to school, computes the average speed for his trip to be 20 km/h. On his return trip along the same route, there is less traffic and the average speed is 30 km/h. What is the average speed for Abdul's trip? (Exercise. Q.3)

Let one way distance $= x$ km

Time taken in forward trip at speed of 20 km/h,

$$\frac{\text{Distance}}{\text{Speed}} = \frac{x}{20} \text{ h}$$

Time taken in return trip at a speed of 30 km/h,

$$\frac{\text{Distance}}{\text{Speed}} = \frac{x}{30} \text{ h}$$

Total time for the whole trip,

$$\frac{x}{20}+\frac{x}{30}=\frac{3x+2x}{60}=\frac{5x}{60}\text{h}$$

$$\text{Total distance covered} = x+x = 2x\ \text{km}$$

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{2x}{5x/60}$$

$$= \frac{2x \times 60}{5x}$$

$$= 24\ \text{km h}^{-1}.$$

15) Define uniform/speed and Non-uniform motion/speed with an example of each.

- **Uniform Motion/Speed:**
  Definition: Uniform motion can be defined as body covers **equal distance** in **equal intervals of time**. **Example:** Motion of the hour/minute/second hand of a clock
  Non-Uniform Motion/Speed:
  Definition: Non-uniform motion can be defined as body covers **unequal distance** in **equal intervals of time**. **Example:** A horse running in a race

16) Convert 108 km/h into m/s

- 108 km/h = (108×1000/3600) m/s = 30 m/s

17) Convert 60 m/s into km/h

- 60 m/s = (60 × 3600/1000) km/h = 216 km/h

18) Define periodic motion. Is an oscillatory motion periodic?

- In **Physics**, motion repeated in equal intervals of time is called a periodic motion.
- Yes, an oscillatory motion is a periodic motion because each oscillation gets completed in a definite time interval of time with repetition.

19) A car travels 30 km at a uniform speed of 40 km/h and the next 30 km at uniform speed of 20 km/h.Find its average speed.

- We know that, Speed=Distance / time **Therefore**, Time =distance / speed

Let's see the first case,

s_1 = distance = 30 km

v_1 = speed = 40 km/h

t_1 = time = 30 / 40 = 3/4 h

Let's see the second case,

s_2 = 30 km

v_2 = 20 km/h

t_2 = 30 / 20 = 3/2 h

Avg. Speed =Total distance/ Total time

= (30 + 30) / (3/4 + 3/2)

= 60 / (3 + 6) /4 = 60 / 9 × 4 =20 / 3 × 4 = 80 / 3= 26.67 km/h

Hence, Average speed of the car is 26.7 km/h (Approx.)

20) On a 120 km track, a train travels the first 30 km at a uniform speed of 30 km/h. How fast must the train travel the next 90 km as to average 60 km/h for the entire trip.

- **Avg. Speed = total distance/total time**

  $\mathbf{V_{avg.} = d_{total}/t}$

  Therefore, total time, $\mathbf{t = d_{total}/ V_{avg.}}$

  For 120 km, t = 120/60 = 2 h

  For 1st 30 km, t_1 = 30/30 = 1 h

  So, time for remaining 90 km (2nd Case), $t_2 = t - t_1 = 2 - 1 = 1$ h

  Therefore speed (for 2nd Case) = distance/time = 90/1 = 90 km/h

  The train must travel the next 90 km with the speed 90km/h.

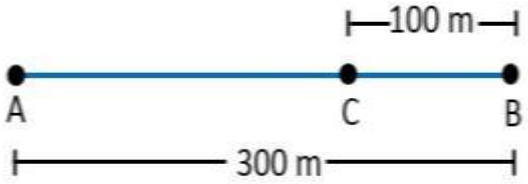
21) Define velocity. Give its SI unit.

- **Velocity** is the **speed** of an object moving in a **specific direction.** **SI unit:** m/s

22) Write three ways through which the velocity of an object can be changed.

- **Three ways are as follows:**
  I. By changing the speed of the body
  II. By changing the direction of motion of the body
  III. By changing both, the speed and direction of motion

23) Joseph jogs from one end A to the other end B of a straight 300 m road in 2 minutes 30 seconds and then turns around and jogs 100 m back to point C in another 1 minute. What are Joseph's average speeds and velocities in jogging (a) from A to B and (b) from A to C?



Velocity = dispacement / time
Speed = distance / time

a) when he jogs from A to B on a straight road,
displacement = distance = 300m
time = 2 minutes 30 seconds = 150 s

velocity = 300/150 = 2 m/s
speed = 300/150 = 2m/s

b)when he jogs from A to B and turns back to C,
displacement = 300-100 = 200m
distance = 300+100 = 400m
time = 3 minute 30 second = 210 s

velocity = 200/210 = 20/21 m/s
speed = 400/210 = 40/21 m/s

24) Distinguish between speed and velocity.

	Speed	Velocity
1	It is a rate of distance. **Speed = Distance/time**	It is a rate of displacement. **Velocity = Displacement/time**
2	It is a scalar quantity.	It is a vector quantity.
3	It is always positive.	It can be positive, negative or zero.
4	It indicates rapidity of an object.	It indicates rapidity and position of an object.

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

- When an object perform its motion on a straight path without changing its direction. In this condition, the distance and displacement becomes equal. Hence, the magnitude of velocity and speed becomes equal.

26) What does the odometer of an automobile measure?

- Distance

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

- Straight line or linear path

28) 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, 3×10^8 m/s.

- Time, t = 5 minutes

  $= 5 \times 60$

  $= 300$ seconds

  Speed of light, $s = 3 \times 10^8$ m/s,

  Distance, d=?

  Speed (s) = Distance (d)/Time (t)

  $d = s \times t$

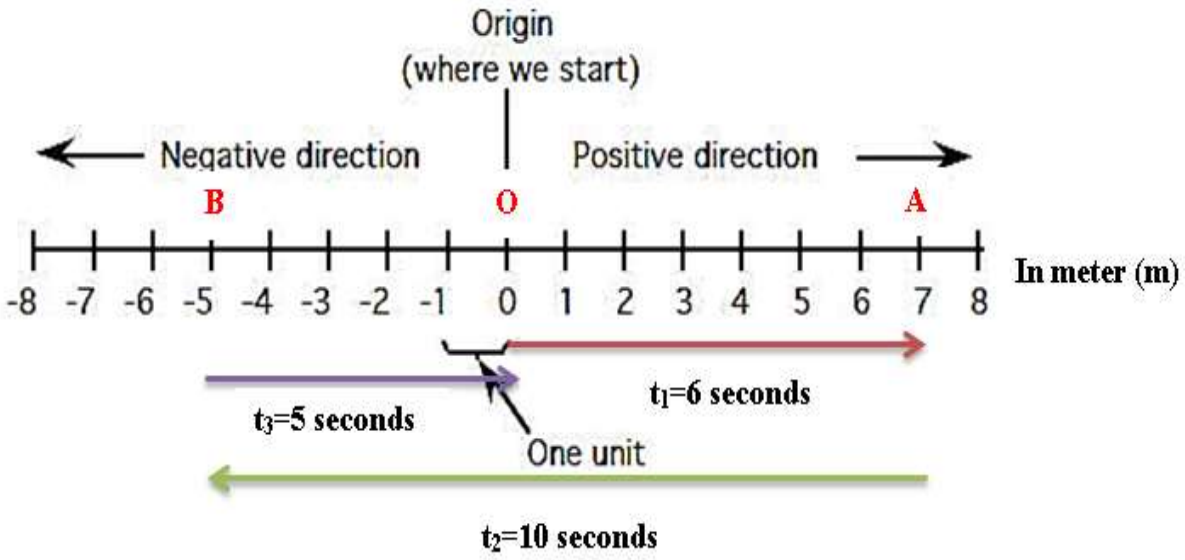
  $= 3 \times 10^8 \times 300$

  $= 900 \times 10^8$

  $= 9 \times 10^{10}$ m

  Therefore, Distance was 9×10^{10} m

29) Observe the figure & give the answer the following questions.



Question 1: Calculate the average speed and average velocity for the path OAB.

For Average speed = Total distance/Total time

$= (OA+AB)/(t_1+t_2) = (7+12)/(6+10) = 19/16 = 1.1875 = 1.2$ m/s

For Average Velocity = Total displacement/Total time

= Final point (B)-Initial point (O)/t_1+t_2)

$= (-5-0)/(6+10) = -5/16 = -0.3125 = -0.3$ m/s

(Negative indicates that body changes its direction opposite to the previous one)

Question 2: Calculate the average speed and average velocity for the path OABO.

For Average speed = Total distance/Total time

$= (OA+AB+BO)/t_1+t_2+t_3)$

$= (7+12+5)/(6+10+5)$

$= 24/21$

$= 1.1428 = 1.1$ m/s

For Average Velocity = Total displacement/Total time

= Final point (O)-Initial point (O)/$t_1+t_2+t_3$)

$= (0-0)/(6+10+5) = 0/21 = 0$ m/s

(Zero displacement indicates that initial point and final point are same)

30) Define acceleration. Give its SI unit.

- It is the rate of change of velocity per unit time.
- **SI unit:** m/s/s = m/s^2

31) Explain the term 'Retardation'. Write an essential condition for having retardation.

- It is the negative rate of change of velocity per unit time. It is always negative.
- **Essential condition:** The final velocity is always less than the initial velocity.
- **Example:** You are running at 7 m/s, and skid to a halt in 2 seconds.

32) List the four examples of acceleration.

- Falling of an object due to gravity
- A driver increases the speed of a car
- A person starts walking from rest
- Waterfall

33) List the four examples of retardation.

- Slowing down vehicle by applying brakes
- Landing of Aeroplane
- When fan is switched off
- A ball is thrown upward against gravity.

34) Differentiate the terms 'acceleration' and 'retardation'.

Acceleration	Retardation
It is always positive.	It is always negative.
Velocity of the body increases with time.	Velocity of the body decreases with time.
Final velocity is greater than Initial velocity.	Final velocity is less than Initial velocity.

35) When will you say a body is in (i) Uniform acceleration? (ii) Non-uniform acceleration?

(i) A body is said to be in uniform acceleration when velocity of the body moving along a straight line changes equally in equal intervals of time.

(ii) A body is said to be in non-uniform acceleration when velocity of the body moving along a straight line changes unequally in equal intervals of time.

36) A bus decreases its speed from 80 km h^{-1} to 60 km/h in 5 s. Find the acceleration of the bus.

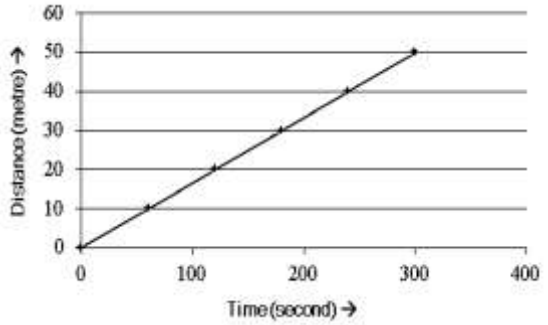
- u= initial velocity= 80 km/h = 22.2 m/s
  v= final velocity = 60 km/h = 16.7 m/s
  t= time = 5 s
  a= acceleration =?
  a=v-u/t
  a= 16.7-22.2/5 = -5.5/5 = - 1.1 m/s^2

37) A train starting from a railway station and moving with uniform acceleration attains a speed 40 km/h in 10 minutes. Find its acceleration.

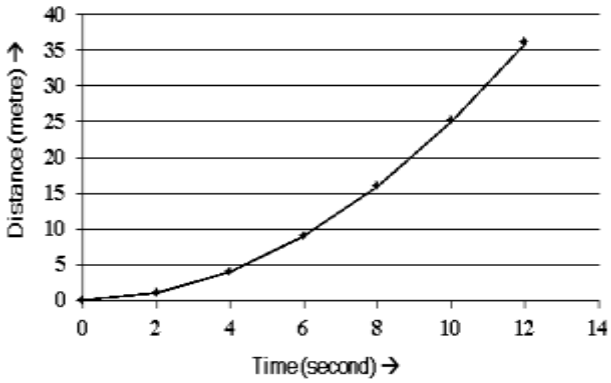
- u= 0 m/s
  v= 40 km/h = 11.11 m/s
  t= 10 minutes = 600 seconds
  a=?
  a=v-u/t
  a= 11.11-0/600 = 11.11/600 = 0.0185 m/s^2

38) Plot distance-time graph for uniform motion and non-uniform motion.

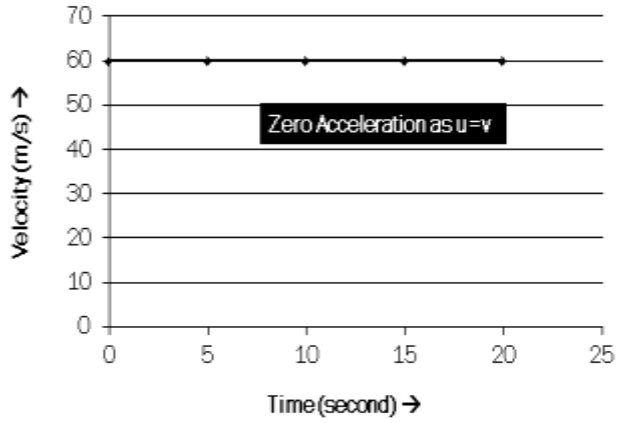
Uniform motion:



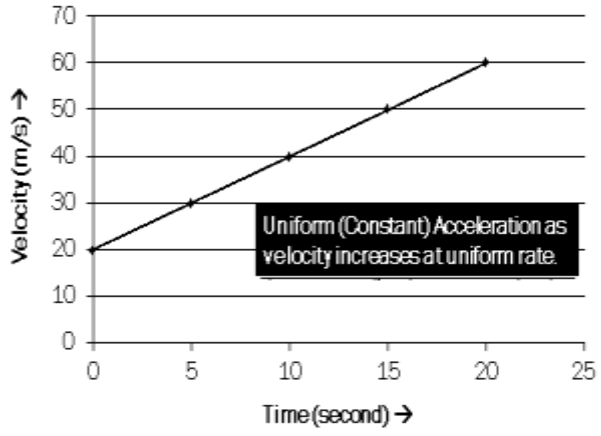
Non-Uniform motion:



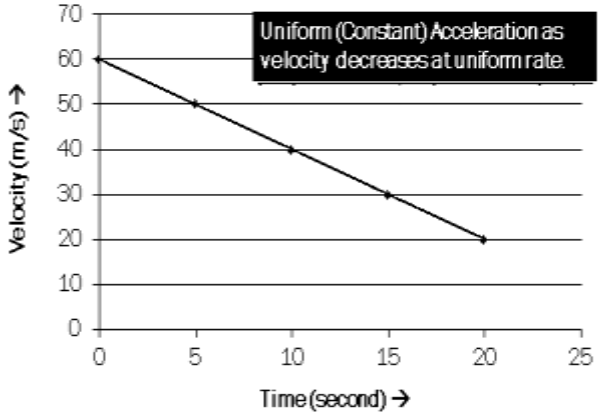
39) Plot velocity-time graph for uniform motion.



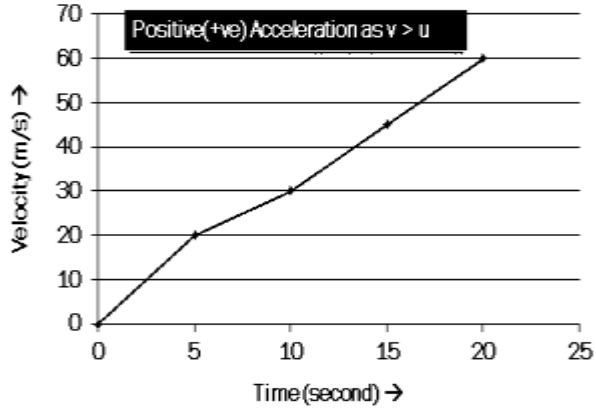
40) Plot velocity-time graph for uniform acceleration.

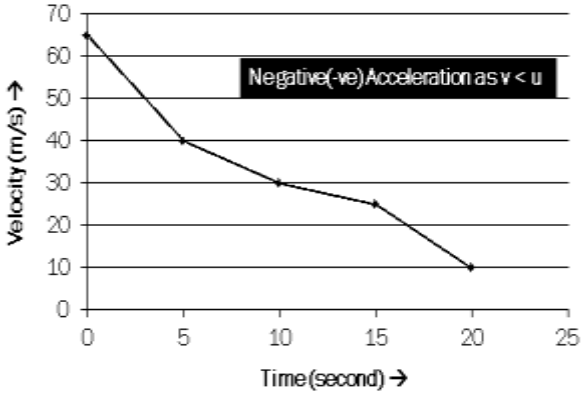


41) Plot velocity-time graph for uniform retardation.



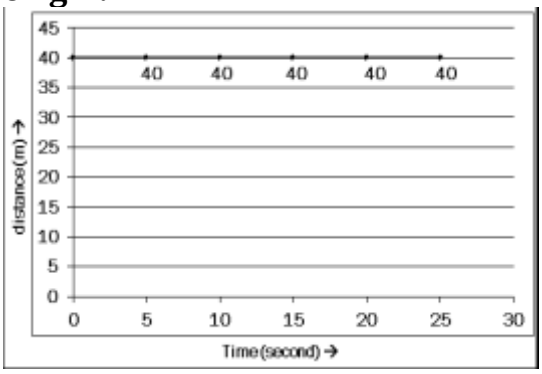
42) Plot velocity-time graph for non-uniform acceleration & retardation.





*****You can plot these graphs as per your choice of data**

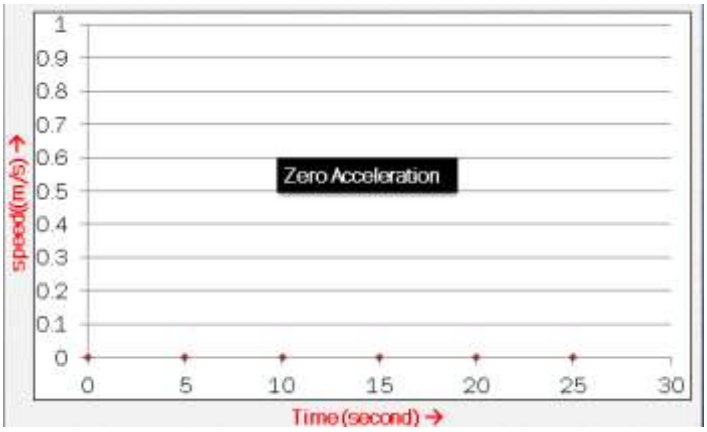
43) Plot distance-time graph for stationary object which is at a distance of 40 m from the origin.



44) Write the characteristics of a distance-time graph.

- It is a straight/linearly inclined for uniform motion or speed.
- It is a typical parabolic curve for non-uniform motion or speed.
- It is a parallel to X-axis or time-axis for stationary object.
- It is a parallel to Y-axis or distance-axis for infinite motion or speed
- The slope of this graph always gives a speed. If the slope is more, the speed is more and if the slope is less, the speed is also less.
- The slope is same for uniform motion at any point.
- The slope varies for non-uniform motion from point to point.

45) Plot speed-time graph for stationary object.



46) Write the characteristics of a speed-time graph.

- The graph is straight/linearly inclined for uniform acceleration.
- The graph is parallel to X-axis or time-axis for uniform motion.
- The graph is irregular for non-uniform motion.
- The graph is parallel to Y-axis or speed-axis for infinite acceleration.
- The slope of this graph represents acceleration. If the slope raise right side, there will be acceleration and if the slope fall right side, there will be retardation.
- The area covered by the graph represents a distance.
- The slope is same for uniform acceleration at any point.
- The slope varies for non-uniform acceleration from point to point.

47) Write the characteristics of a velocity-time graph.

- The graph is straight/linearly inclined for uniform acceleration.
- The graph is parallel to X-axis or time-axis for uniform motion.
- The graph is irregular for non-uniform motion.
- The graph is parallel to Y-axis or speed-axis for infinite acceleration.
- The slope of this graph represents acceleration. If the slope raise right side, there will be acceleration and if the slope fall right side, there will be retardation.
- The area covered by the graph represents a displacement /distance.
- The slope is same for uniform acceleration at any point.
- The slope varies for non-uniform acceleration from point to point.

48) Which physical quantity is taken on X-axis during representation of motion in graph?

- Time

49) A driver of a car travelling at 52 km/h applies the brakes and accelerates uniformly in the opposite direction. The car stops in 5 s. Another driver going at 3 km/h in another car applies his brakes slowly and stops in 10 s. On the same graph paper, plot the speed versus time graphs for the two cars. Which of the two cars travelled farther after the brakes were applied?

Ans. Here, initial speed of 1st car, $u = \frac{52\,\text{km}}{\text{h}} = \frac{52\times1000\,\text{m}}{60\times60\,\text{s}} = 14{\cdot}4\,\text{m/s}$

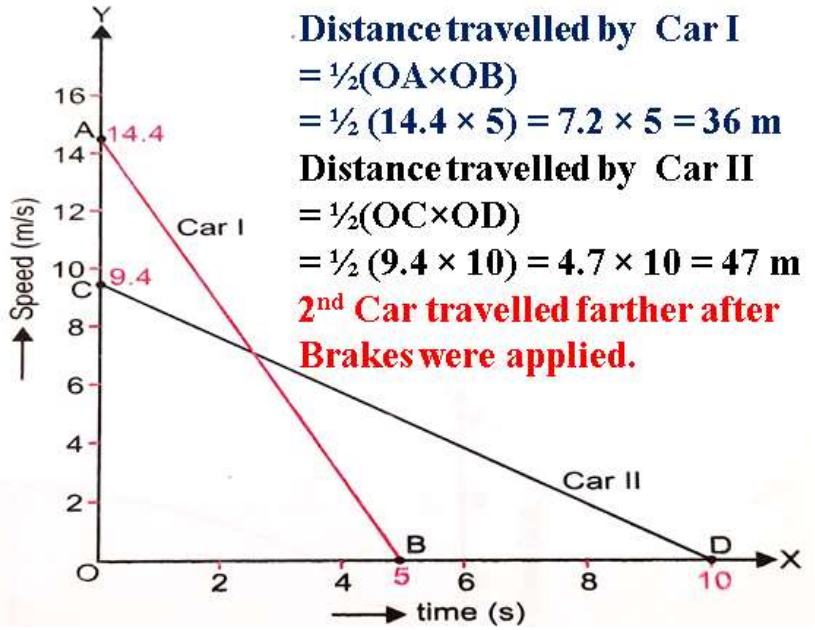
final speed, $v = 0$, time taken, $t = 5\,\text{s}$

$$\text{Acceleration} = \frac{\text{final speed} - \text{initial speed}}{\text{time taken}} = \frac{0-14{\cdot}4}{5} = -2{\cdot}88\,\text{m/s}^2$$

Negative sign is for retardation.

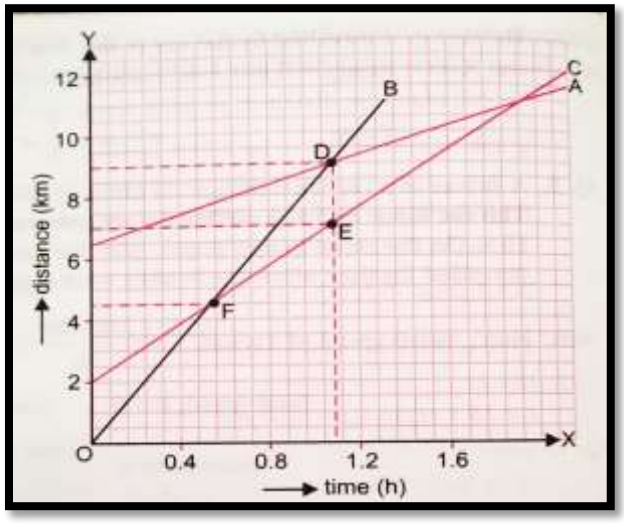
Similarly, for second car, $u = \frac{34\,\text{km}}{\text{h}} = \frac{34\times1000\,\text{m}}{60\times60\,\text{s}} = 9{\cdot}4\,\text{m/s}$, $v = 0\,;\, t = 10\,\text{s}$

$$\text{Acceleration} = \frac{v-u}{t} = \frac{0-9{\cdot}4}{10} = -0{\cdot}94\,\text{m/s}^2$$



Distance travelled by Car I
= ½(OA×OB)
= ½ (14.4 × 5) = 7.2 × 5 = 36 m
Distance travelled by Car II
= ½(OC×OD)
= ½ (9.4 × 10) = 4.7 × 10 = 47 m
2nd Car travelled farther after Brakes were applied.

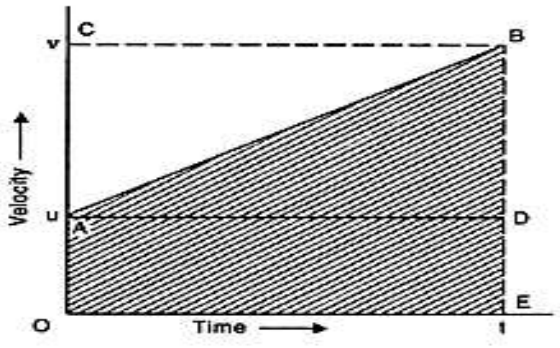
50) Fig 8.11 shows the distance-time graph of three objects A,B and C. Study the graph and answer the following questions:



(a) Which of the three is travelling the fastest?
(b) Are all three ever at the same point on the road?
(c) How far has C travelled when B passes A?
(d) How far has B travelled by the time it passes C?

a) B is travelling fastest
b) No
c) 7 km
d) 4.5 km

Q.51 Derive the equations for uniform accelerated motion by using the graphical method.



Assume that an object is moving with initial velocity u at t = 0 second.
Now, that body accelerates itself and acquires velocity v at t = t seconds.
From, velocity-time graph,
OA = ED = u. EB = v, BD = EB – ED = v – u,
OE = AD = t,
1st Equation:
From, velocity-time graph,
Slope = tanθ = acceleration, a = BD/AD = v – u/t
∴a = v-u/t
∴at = v-u ------- (1)
∴v = u + at ------ (2)
2nd Equation:
From, velocity-time graph,
Distance travelled = Area of a trapezium ABEO = Area of ADB + Area of ADEO

$\therefore s = \frac{1}{2} AD \times DB + AD \times DE$

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

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

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

3rd Equation:
Distance travelled = Area of a trapezium ABEO
$\therefore s = \frac{1}{2} (OA + EB) \times OE$
$\therefore s = \frac{1}{2} (u + v) \times t$
We know that a = v-u/t
$\therefore s = (u + v)/2 \times (v – u)/a$
$\therefore s = (u + v) (v – u)/2a$
$\therefore 2a\ s = (v + u) (v – u)$
$\therefore 2a\ s = v^2 – u^2$

Q.52 *A bus starting from rest moves with a uniform acceleration of 0.1 m s^{-2} for 2 minutes. Find (a) the speed acquired, (b) the distance travelled.*

u = 0 m/s, a =0.1 m/s^2, t = 2 minutes = 120 s

v= u + at

= 0 + (0.1) (120)

= 0 + 12 = 12 m/s

s = u t + ½ a t^2

= 0 + ½ (0.1) $(120)^2$

= 0 + ½ (0.1)(14400)

= 0 + ½ (1440) = 720 m

Q.53 *A train is travelling at a speed of 90 km h^{-1}. Brakes are applied so as to produce a uniform acceleration of – 0.5 m s^{-2}. Find how far the train will go before it is brought to rest.*

u = 90 km/h = 25 m/s, v = 0 m/s

s = ?

$v^2 – u^2 = 2as$

$0^2 – (25)^2 = 2(-0.5)s$

-625 = 2(-0.5)s

-625 = -s

s= 625m

Q.54 A trolley, while going down an inclined plane, has an acceleration of 2 cm s^{-2}. What will be its velocity 3 s after the start?

u = 0 cm/s , v =?, a = 2 cm/s^2 , t = 3 s

v= u + at

v= 0 + (2)(3)

v= 6 cm/s

Q.55 A racing car has a uniform acceleration of 4 m s^{-2}. What distance will it cover in 10 s after start?

u = 0 m/s, a = 4 m/s^2 , t = 10 seconds

s = ?

$s = u\,t + \frac{1}{2}\,a\,t^2$

$= 0 + \frac{1}{2}\,(4)\,(10)^2$

$= 0 + \frac{1}{2}\,(4)\,(100)$

$= 0 + (2)(100)$

s = 200 m

It will cover 200 m in 10 s after start.

Q.56 A stone is thrown in a vertically upward direction with a velocity of 5 m s^{-1}. If the acceleration of the stone during its motion is 10 m s^{-2} in the downward direction, what will be the height attained by the stone and how much time will it take to reach there?

To find the height attained,

$v^2 - u^2 = 2ah$

h = Height attained = $(v^2 - u^2)/2a$

$= (0^2 - 5^2)/2a$

$= (0 - 25)/(2)(-10)$

$= -25/-20$

$= 1.25m$

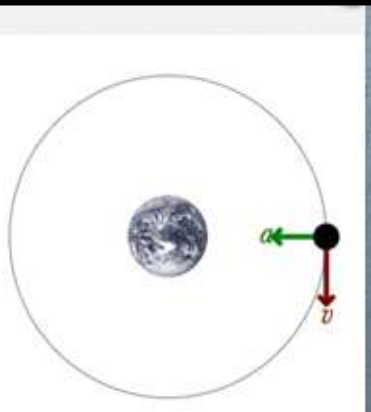
$t = (v - u)/a = (-5)/(-10) = 0.5$ s

Q.57

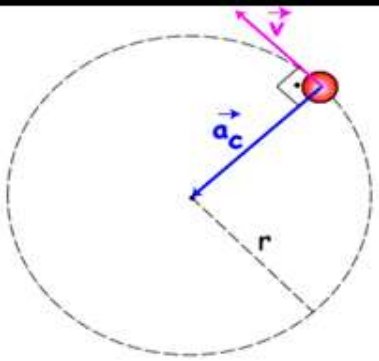
Uniform Circular Motion

Definition: Uniform circular motion can be described as the motion of an object in a circle at a constant speed.

As an object moves in a circle, it is constantly changing its direction. At all instances, the object is moving tangent to the circle. Since the direction of the velocity vector is the same as the direction of the object's motion, the velocity vector is directed tangent to the circle as well. The animation at the right depicts this by means of a vector arrow.



SPEED OF AN OBJECT DURING CIRCULAR MOTION



Speed of an object is given by

- $v = \frac{2\pi r}{T}$

Where r = radius of circular path

T= time period of an object

Q.58 A motorboat starting from rest on a lake accelerates in a straight line at a constant rate of 3.0 m s^{-2} for 8.0 s. How far does the boat travel during this time?

$u = 0$ m/s, $a = 3$m/s^2, $t = 8$ seconds

$s = ?$

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

$= 0 + \frac{1}{2} (3) (8)^2$

$= 0 + \frac{1}{2} (3) (64)$

$= 0 + (3)(32)$

$= 96$ m

The boat travels 96 m during this time.

Q.59

A ball is gently dropped from a height of 20 m. If its velocity increases uniformly at the rate of $10 ms^{-2}$, with what velocity will it strike the ground? After what time will it strike the ground?

Answer 7:

Here, $u = 0$ m/s, $s = 20$ m, $a = 10\ ms^{-2}$, $v = ?$, $t = ?$

Using $v^2 - u^2 = 2as$

We have, $v^2 - 0^2 = 2 \times 10 \times 20 = 400 \Rightarrow v = 20\ ms^{-1}$.

and $t = (v - u) \div a = 20 \div 10 = 2$ s.

Q.8 of Exercise (Omitted)

Q.59 . State which of the following situations are possible and give an example for each of these: (a) an object with a constant acceleration but with zero velocity (b) an object moving with an acceleration but with uniform speed. (c) an object moving in a certain direction with an acceleration in the perpendicular direction.

Solution

(a) It is possible; an object thrown up into the air has a constant acceleration due to gravity acting on it. However, when it reaches its maximum height, its velocity is zero.

(b) it is impossible; acceleration implies an increase or decrease in speed, and uniform speed implies that the speed does not change over time

(c) It is possible; for an object accelerating in a circular trajectory, the acceleration is perpendicular to the direction followed by the object.

Q.60 An artificial satellite is moving in a circular orbit of radius 42250 km. Calculate its speed if it takes 24 hours to revolve around the earth.

R = 42250 km,

T = 24 h,

Speed, v = ?

$$v = \frac{2\pi R}{T}$$

$$= \frac{2 \times 22/7 \times 42250}{24} = \frac{2 \times 22 \times 42250}{24 \times 7} = \frac{11 \times 21125}{21}$$

$$= 11065.47$$

$$= 1.1 \times 10^4 \text{ km/h}$$

The speed of the satellite is 1.1×10^4 km/h

Delhi Public School, Gandhinagar

Class: IX **Subject: Science**

CHAPTER-2
IS MATTER OUR US PURE

Pg. No. 15

Q.1 **What is meant by a pure substance?**

A.1 Substance that has a uniform composition i.e. has particles with identical properties is called pure substance.

Q.2 **List the points of differences between homogeneous and heterogeneous mixtures.**

A.2 Same as Q.1 Pg. No 18 of text book.

Page No. 18

Q.1 **Differentiate between homogeneous and heterogeneous mixtures with examples.**

A.1

S.No.	Homogeneous Mixture	Homogeneous Mixture
1.	It is a uniform mixture.	It is a non- uniform mixture.
2.	Distinct boundaries are not visible.	Distinct boundaries are visible in some solid mixtures and immiscible liquid mixture.

Q.2 **How are sol, solution and suspension different from each other?**

A.2

S.	Properties	Solution	Colloid	Suspension
1.	Particle size	Less than 1nm	Between 1nm-100nm	Larger than 100nm
2.	Nature	Homogeneous	Heterogeneous	Heterogeneous
3.	Filterability	It passes through filter paper	It passes through filter paper	It does not pass through filter paper
4.	Tyndall effect	Does not show as scattering of light do not occur	Show as scattering of light occurs	May or may not show tyndall effect

Q.3 **To make a saturated solution, 36 g of sodium chloride is dissolved in 100 g of water at 293K. Find its concentration at this temperature.**

A.3 Mass of solute (sodium chloride) =36g
Mass of solvent (water) =100g
Mass of solution = Mass of Solute + Mass of solvent
= 36g +100g
= 136g

Page No. 24 A

Q.1 **How will you separate a mixture containing kerosene and petrol (difference in their boiling points is more than 25^0C), which are miscible with each other?**

A.1 We can separate a mixture containing kerosene and petrol by distillation technique since difference in their boiling points is more than 25^0C. Therefore, they can be easily separated by the technique of simple distillation

Q.2 **Name the technique to separate**
(i) butter from curd, (ii) salt from sea-water, (iii) camphor from salt

A.2 **(i)** centrifugation method.
(ii) evaporation method or crystallisation method
(iii) sublimation method.

Q.3 **What types of mixtures are separated by the technique of crystallisation?**

A.3 From impure samples of solids, pure solid crystals can be obtained by the method of crystallization for e.g. to obtain pure sugar from impure sample of the same.

Page No. 24 B

Q.1 **Classify the following as chemical or physical changes:**

- **cutting of trees,**
- **melting of butter in a pan,**
- **rusting of almirah,**
- **boiling of water to form steam,**
- **passing of electric current through water and the water breaking down into hydrogen and oxygen gases,**
- **dissolving common salt in water,**
- **making a fruit salad with raw fruits, and**
- **burning of paper and wood.**

A.1

- Cutting of trees = chemical change
- Melting of butter in a pan = physical change
- Rusting of almirah = chemical change
- Boiling of water to form steam = physical change
- Passing of electric current through water and the water breaking down into hydrogen and oxygen gases = chemical change
- Dissolving common salt in water = physical change
- Making a fruit salad with raw fruits = physical change
- Burning of paper and wood = chemical change

Q.2 **Try segregating the things around you as pure substances or mixtures.**

A.2 To be discussed in the class

Pg No. 28 Exercise

Q.1 **Which separation techniques will you apply for the separation of the following?**

(a) **Sodium chloride from its solution in water.**
(b) **Ammonium chloride from a mixture containing sodium chloride and ammonium chloride.**
(c) **Small pieces of metal in the engine oil of a car.**
(d) **Different pigments from an extract of flower petals.**
(e) **Butter from curd.**
(f) **Oil from water.**
(g) **Tea leaves from tea.**
(h) **Iron pins from sand.**
(i) **Wheat grains from husk.**
(j) **Fine mud particles suspended**

A.1
(a) Evaporation
(b) Sublimation
(c) Filtration
(d) Chromatography
(e) Centrifugation
(f) Separating funnel
(g) Filtration
(h) with the help of a magnet
(i) Blowing air or sieving
(j) using alum

Q.2 **Write the steps you would use for making tea. Use the words solution, solvent, solute, dissolve, soluble, insoluble, filtrate and residue.**

A.2 To be discussed in class.

Q.3 **Pragya tested the solubility of three different substances at different temperatures and collected the data as given below (results are given in the following table, as grams of substance dissolved in 100 grams of water to form a saturated solution.**

A.3 (a) **What mass of potassium nitrate would be needed to produce a saturated solution of potassium nitrate in 50 grams of water at 313 K?**

At 313 K temperature the amount of potassium nitrate required was 62g in 100ml of water so in 50g water we will need to dissolve = 62 X 50/100
= 31g potassium nitrate.

(b) **Pragya makes a saturated solution of potassium chloride in water at 353 K and leaves the solution to cool at room temperature. What would she observe as the solution cools? Explain.**

When a saturated solution of potassium chloride at 353 K is cooled, the solubility of potassium chloride in water decreases. As a result, the amount of potassium chloride which exceeds its solubility at lower temperature separates out as crystals.

(c) **Find the solubility of each salt at 293 K. Which salt has the highest solubility at this temperature?**

The highest solubility is of ammonium chloride at this temperature.

(d) **What is the effect of change of temperature on the solubility of a salt?**

Solubility of salts is directly proportional to the temperature i.e. if temperature increases then solubility will increase and if the temperature decreases solubility will also decrease.

Q.4 **Explain the following giving examples.**

(a) **saturated solution**
(b) **pure substance**
(c) **colloid**
(d) **suspension**

A.4 (a) **Saturated solution: -** It is a solution in which no more solute particles can be dissolved at a particular temperature.

(b) **Pure substance: -** Such substance that has a uniform composition i.e. has particles with identical properties is called pure substance eg sugar, salt, water, nitrogen etc.

(c) **Colloid: -** It is a kind of heterogeneous mixture/solution in which particle size is between 1nm and 1000nm. Colloids have dispersion medium and dispersed phase.eg smoke

(d) **Suspension: -** It is a kind of heterogeneous mixture in which insoluble solid particles remain suspended in the medium and dispersion particles are visible to the unaided eyes. eg muddy river water

Q.5 to Q.9 and Q.11 to be discussed in the class and mark in the text book.

Q.5 **Classify each of the following as a homogeneous or heterogeneous mixture.**
Soda water, wood, air, soil, vinegar, filtered tea.

A.5 To be discussed in class.

Q.6 **How would you confirm that a colourless liquid given to you is pure water?**

A.6 If the boiling point and freezing point of the given liquid comes out to be 100^{o} Celsius (373 K) or 0^{o}Celsius (273 K) respectively under one atmosphere pressure, it confirms that the given liquid is pure water.

Q.7 **Which of the following materials fall in the category of a "pure substance"?**

(a) **Ice**
(b) **Milk**
(c) **Iron**
(d) **Hydrochloric acid**
(e) **Calcium oxide**
(f) **Mercury**
(g) **Brick**
(h) **Wood**
(i) **Air**

A.7 Pure substances are: ice, iron, calcium oxide, mercury since they contain particles of only one kind of matter.

Q.8 **Identify the solutions among the following mixtures.**

A.8 (a) **Soil**
(b) **Sea water**
(c) **Air**
(d) **Coal**
(e) **Soda water.**
Sea water and soda water are solutions.

Q.9 **Which of the following will show "Tyndall effect"?**
(a) **Salt solution**
(b) **Milk**
(c) **Copper sulphate solution**
(d) **Starch solution.**

A.9 (b) and (d) (to be discussed in class.)

Q.10 **Classify the following into elements, compounds and mixtures:**

(a) **Sodium**
(b) **Soil**
(c) **Sugar solution**
(d) **Silver**
(e) **Calcium carbonate**
(f) **Tin**
(g) **Silicon**
(h) **Carbondioxide**
(i) **Air**

A.10 Classification of the given substances in elements, compounds and mixtures:
Elements: Sodium, Silver, Tin and Silicon.
Compounds: Calcium carbonate, Methane and carbon dioxide.
Mixtures: Soil, Sugar, Air, Soap and Blood.

Q.11 **Which of the following are chemical changes?**
(a) **Growth of a plant**
(b) **Rusting of iron**
(c) **Mixing of iron filings and sand**
(d) **Cooking of food**
(e) **Digestion of food**
(f) **Freezing of water**
(g) **Burning of a candle**

A.11 Growth of a plant, rusting of iron, cooking of food, digestion of food, burning of a candle are chemical changes.

Delhi Public School, Gandhinagar

Class: IX **Subject: Science**

Extra Questions

Q.1 A fractionating column in the set-up of fractional distillation is provided with beads. Give reason.

Q.2 What is tincture of iodine?

Q.3 List two conditions essential for using distillation as a method for separation of the components from a mixture.

Q.4 Calculate the concentration of 45 g salt present in 500 g of solution.

Q.5 How is fog different from smoke?

Q.6 Describe an activity to separate the two immiscible liquids.

Q.7 **a)** On heating, calcium carbonate gets converted into calcium oxide and carbon dioxide.

i) Identify the process as a physical or chemical.

ii) Write the chemical formula of calcium carbonate and calcium oxide.

b) Name a non-metal which:

i) is required for combustion, ii) exist as a liquid at room temperature

Q.8 Is water a compound? Prove your answer

CHAPTER-6
TISSUES

Date Slot: **No. of Periods:**

Pg. No. 69

Q.1 **What is a tissue? (Discussed in chapter end exercise)**

Ans It is a group of cells similar in origin and structure and they are specialized to perform a particular function like muscle cells in our body forms the muscle tissue that brings about body movements (specific function).

Q.2 **What is the utility of tissues in multi-cellular organisms?**

Ans There is a clear-cut division of labour in multicellular organisms i.e. different parts of the body of a multicellular organism perform specific functions. For example, brain controls all other parts of body, heart pumps blood to all parts of body, kidneys remove waste materials from body, sense organs collect information from external sources for sensory perception etc. All these functions would never be possible without formation of tissues in multicellular organisms.

Pg. No. 74

Q.1 **Name types of simple tissues.**

Ans. The simple tissues (found in plants) are of following three types:
(a) Parenchyma
(b) Collenchyma
(c) Sclerenchyma

Q.2 **Where is apical meristem found?**

Ans The apical meristem is found at the apex (growing tips) of the stem and roots.

Q.3 **Which tissue makes up the husk of coconut? (To be done in T.B.)**

Ans Sclerenchymatous fibres

Q.4 **What are the constituents of phloem?**

Ans The constituents of phloem are: sieve tubes, companion cells, phloem parenchyma, phloem fibres (bast).

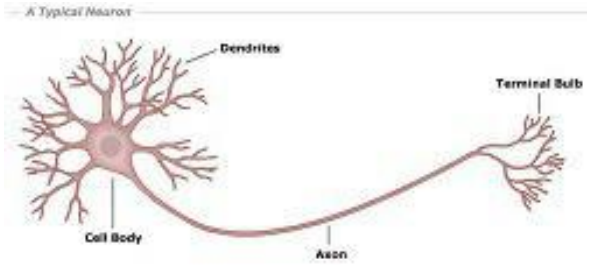
Pg. No. 78

Q.1 **Name the tissue responsible for movement in our body. (To be done in T.B.)**

Ans Muscle/muscular tissue.

Q.2 **What does a neuron look like?**

Ans A neuron comprises of a cell body (Cyton) along with one or more short branches (Dendron) and one hair like long branch (Axon).



Q.3 **Give three features of cardiac muscles.**

Ans **(i)** Cardiac muscles are involuntary i.e. they don't work under our will.
(ii) Its cells are cylindrical, branched, faintly striated and uninucleate.

(iii) It shows rhythmic contraction and relaxation throughout the person's life.

Q.4 **What are the functions of areolar tissue?**

Ans Areolar tissue is a kind of filler tissue found between skin and muscles, around our blood vessels and nerve cells and also in the bone marrow. Its functions are therefore

i) To fill the space inside organs.

ii) To help in repair and maintenance of nearby tissues/organs.

iii) To support and prevent injuries to internal organs.

Chapter – end

Q.1 **Define the term "tissue".**

Ans It is a group of cells similar in origin and structure and they are specialized to perform a particular function like muscle cells in our body forms the muscle tissue that brings about body movements (specific function).

Q.2 **How many types of elements together make up the xylem tissue? Name them.**

Xylem tissue is made up of following 4 types of elements:

i) Tracheids; **ii)** Vessels; **iii)** Xylem fibres and **iv)** Xylem parenchyma

Q.3 **How are simple tissues different from complex tissues in plants?**

Ans

Simple tissue	Complex tissue
i) It is made up of only one type of cells. ii) All cells of this tissue work as individual units to perform a particular function. Eg. parenchyma, collenchyma and sclerenchyma tissues.	i) It is made up of more than one type of cells. ii) Cells of this tissue work together as one single unit to bring about a particular function. Eg. xylem and phloem tissues.

Q.4 **Differentiate between parenchyma, collenchyma and sclerenchyma on the basis of their cell wall.**

Ans

Parenchyma	Collenchyma	Sclerenchyma
Cell wall is thin and made up of cellulose.	Cell wall is irregularly thickened at corners due to deposition of pectin.	Cell wall is very thick due to deposition of impermeable substance lignin.

Q.5 **What are the functions of the stomata?**

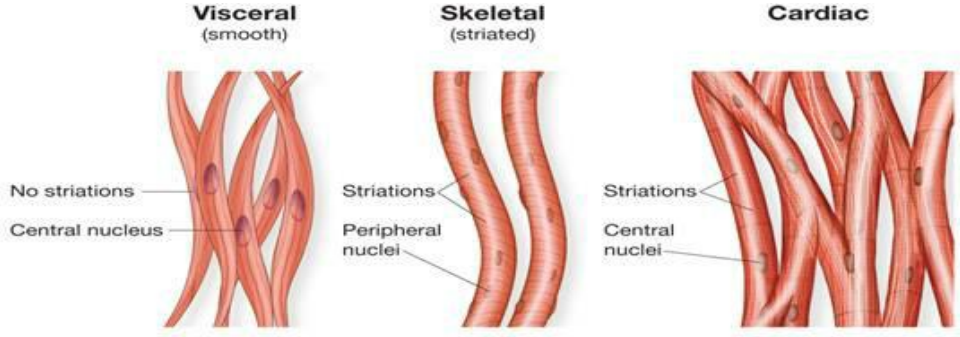
Ans The functions of stomata are:

i) Gaseous exchange like exchange of CO_2 and O_2.

ii) Process of transpiration i.e. loss of excess water in the form of water vapour occurs through stomata.

Q.6 **Diagrammatically show the difference between the three types of muscle fibres.**

Ans



	Visceral (smooth)	Skeletal (striated)	Cardiac
Contracts	Slowly	Rapidly	Rapidly
Found	Viscera, blood vessels	Trunk, extremities, head and neck	Heart
Control	Involuntary	Voluntary	Involuntary

Q.7 **What is the specific function of the cardiac muscle? (to be discussed/marked)**

Ans Cardiac muscles are the muscles of heart that pumps blood to all parts of body and the pumping needs rhythmic contraction and relaxation of cardiac muscles throughout the life without any fatigue.

Q.8 **Differentiate between striated, unstriated and cardiac muscles on the basis of their structure and site/location in the body. (To be combined with Q.6)**

Ans

Striated muscle	Unstriated muscle	Cardiac muscle
They show light and dark bands (striations) when we stain them. Their cells are elongated and cylindrical also unbranched. Cells are multinucleate.	They don't show any striations on staining. Their cells are long but spindle shaped and unbranched. Cells are uninucleate.	They show striations on staining. Their cells re cylindrical and branched. Cells are uninucleate.
They are responsible to bring about voluntary movements (like tongue, limbs etc)	They are involuntary in action (walls of tubular organs, blood vessels etc)	They are again involuntary in their function (contraction and relaxation of heart)

Q.9 **Draw a labelled diagram of a neuron. (Already discussed)**

Q.10 **Name the following. (To be discussed/marked)**

Ans
(a) Tissue that forms the inner lining of our mouth- Epithelial tissue
(b) Tissue that connects muscle to bone in humans- Tendon
(c) Tissue that transports food in plants- Phloem
(d) Tissue that stores fat in our body- Adipose
(e) Connective tissue with a fluid matrix- Blood and lymph
(f) Tissue present in the brain- Nervous tissue

Q.11 **Identify the type of tissue in the following: skin, bark of tree, bone, lining of kidney tubule, vascular bundle. (to be discussed/marked)**

Ans

Skin	Epithelial tissue
Bark of tree	Sclerenchymatous tissue
Bone	Connective tissue
Lining of kidney tubule	Cuboidal epithelial tissue
Vascular bundle	Complex permanent tissue

Q.12 **Name the regions in which parenchyma tissue is present.**

Ans Parenchymatous tissue is present in the epidermis, cortex, pith of the stem, root, leaves, flowers and fruits of plants.

Q.13 **What is the role of epidermis in plants?**

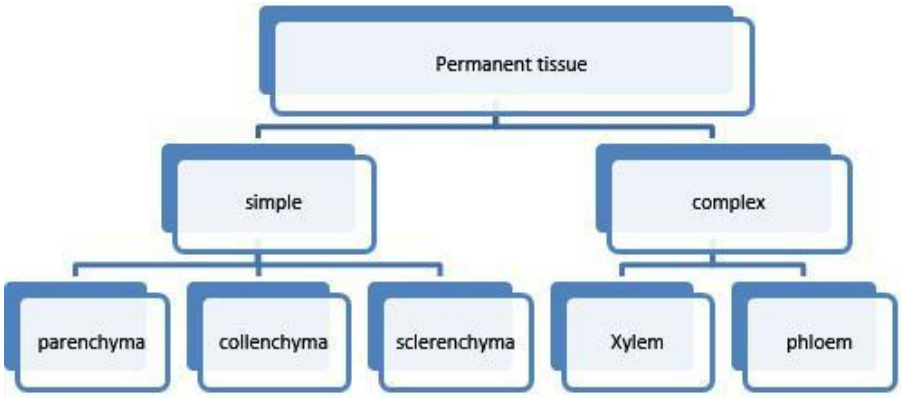
Ans It is a protective layer to the plant parts. It can also absorb water from soil like in the roots and even allow exchange of gases through stomata. It also helps in preventing the entry of pathogens.

Q.14 **How does the cork act as a protective tissue?**

Ans In plants the secondary meristem cuts off many external layers of cells that are dead and arranged in a compact manner. Such layers together make cork. They have deposition of suberin which is very hard and impermeable hence protects plants from unfavourable conditions and microbial attack etc.

Q.15 **Complete the table: (To be discussed/marked)**

Ans


Permanent tissue
simple
complex
parenchyma
collenchyma
sclerenchyma
Xylem
phloem

CLASS-IX SCIENCE (PHYSICS)

NOTES (ONLY FOR REFERENCE)

CHAPTER: 9 FORCE AND LAWS OF MOTION

Dynamics: It is the branch of mechanics (physics) which deals with the causes of motion.

Force: It is an external effort in the form of pushing, pulling, stretching, throwing, tearing, swimming, compressing etc.

Note: An external effort can be given by an external agency (Living or Non-living thing).

There are two types of force: (1) Contact force (2) Non-contact force

(1) **Contact force** that requires physical contact to do a physical task or work. For example, a boy is pushing a table.
Example: friction force, compressive force, tensile force

(2) **Non-contact force** that doesn't require any physical contact to do a task or work. For example, a ball is falling towards the earth due to its gravity.
Example: gravitational force, magnetic force, electrostatic force

SI unit of force: Newton (N)

Note: Force is a vector quantity.

List of effects can be produced with the help of force:

- It may move a stationary body.
- It may stop a moving body.
- It may change the speed of a body.
- It may change the direction of a body.
- It may change the size & shape of a body.

Balanced Forces: If two individual forces are of equal magnitude and opposite direction, then the forces are said to be balanced.

Un-balanced Force: If an individual force is not being balanced by force of equal magnitude and opposite direction, then the forces are said to be un-balanced.

Note: Balanced forces do not cause any change in the state of a body.

Note: When any system is under the effect of balanced forces, the net force on the system becomes zero whereas under the effect of un-balanced force, the net force on the system becomes non-zero.

Examples of Balanced forces:

- A person is standing on a ground.
- A book is lying on the table.
- A boy is trying to push the wall.
- Both teams are applying the same forces but in opposite direction in tug of war.
- Two wrestlers are applying the same pushing force on each other.

Examples of Un-balanced forces:

- A rocket is moving upward to go in the space.
- A football moves while it is kicked by a player
- A seesaw oscillates when it is loaded with different weight on both the ends.
- A bike starts moving when it is accelerated with the help of an accelerator.
- A small paper piece moves randomly when it is blown with an air.

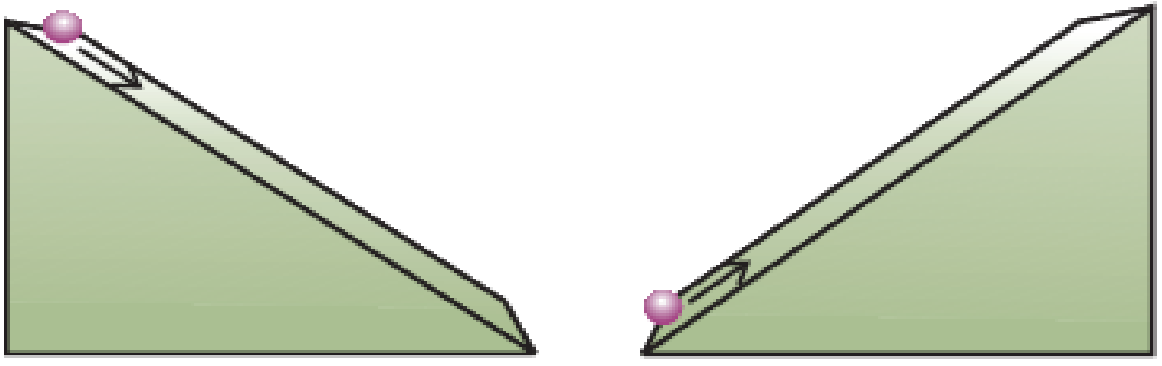
Aristotle's Statement/Fallacy:

"An External force is required to keep body in uniform motion. A body has a natural state of being in rest."

- Actually an external force is required to overcome the effect of opposite forces that are produced naturally (for example-friction force).
- If there is no friction between the body and surface on which it is moving then the body will never stop. Also no external force is required.
- Aristotle couldn't explain above discussion.

Galileo's observation:

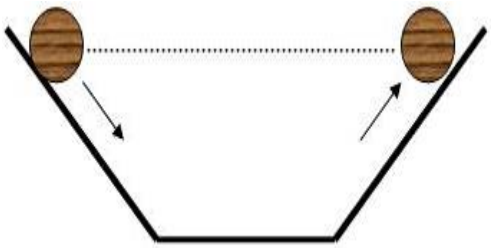
He observed that when a marble rolls down an inclined plane, its velocity increases as shown in figure (a) and its velocity decreases when it climbs up as shown in Fig.(b).



(a) (b)

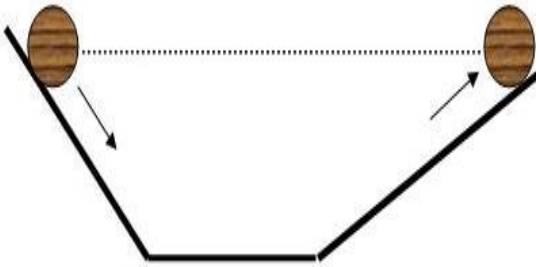
1st Experiment:

Galileo argued that when the marble is released from left, it would roll down the slope and go up on the opposite side to the same height from which it was released. If the inclinations of the planes on both sides are equal then the marble will climb the same distance that it covered while rolling down.



2nd Experiment:

If the angle of inclination of the right-side plane were gradually decreased, then the marble would travel further distances till it reaches the original height.



3rd Experiment:

If the right-side plane were ultimately made horizontal (that is, the slope is reduced to zero), the marble would continue to travel forever (on frictional less surface) trying to reach the same height that it was released from.

Ideas of Galileo:

1) An unbalanced external force is required to initiate the motion (from state of rest).
2) Objects move with a constant speed along a straight line when no unbalanced force (presence of balanced forces) acts on them.
3) In practical situations it is difficult to achieve a zero unbalanced force. This is because of the presence of the frictional force acting opposite to the direction of motion. Thus, in practice the marble stops after travelling some distance.

Statement of Galileo:

"Every object continues to be in its state of rest or uniform motion in a straight line unless it is compelled by some un-balance external force to act."

First law of Newton:

"An object remains in a state of rest or of uniform motion in a straight line unless it is compelled to change that state by an applied un-balanced external force."

- In a qualitative way, the tendency of undisturbed objects to stay at rest or to keep moving with the same velocity is called inertia. This is why, the first law of motion is also known as the law of inertia.

Examples:

- We tend to remain at rest with respect to the seat until the driver applies a braking force to stop the motorcar. With the application of brakes, the car slows down but our body tends to continue in the same state of motion because of its inertia. A sudden application of brakes may thus cause injury to us by impact or collision with the panels in front. Safety belts are worn to prevent such accidents. Safety belts exert a force on our body to make the forward motion slower.
- An opposite experience is encountered when we are standing in a bus and the bus begins to move suddenly. Now we tend to fall backwards. This is because the sudden start of the bus brings motion to the bus as well as to our feet in contact with the floor of the bus. But the rest of our body opposes this motion because of its inertia.
- When a motorcar makes a sharp turn at a high speed, we tend to get thrown to one side. This can again be explained on the basis of the law of inertia. We tend to continue in our straight-line motion. When an unbalanced force is applied by the engine to change the direction of motion of the motorcar, we slip to one side of the seat due to the inertia of our body.
- Initially, leaves and tree both are in rest. But when the tree is shaken vigorously, tree comes in motion while leaves have to be in rest and because of that the leaves may get detached from tree.

- Attempt a sharp horizontal hit at the bottom of the pile using striker. If the hit is strong enough, the bottom coin moves out quickly. Once the lowest coin is removed, the inertia of other coins makes them 'fall' vertically on the table.

Concept of Inertia:

'There is a resistance offered by an object to change its state of motion. If it is at rest it tends to remain at rest; if it is moving it tends to keep moving. This property of an object is called its inertia.' Inertia has no unit because it is just a property, not physical quantity.

Note: Different bodies have different inertia because of their different masses.

Types of Inertia:

Inertia of rest - An object stays where it is placed, and it will stay there until you or something else moves it. (i.e. Dust particles stay at rest until you shake a carpet.)

Inertia of motion - An object will continue at the same speed until a force acts on it. (i.e. Body going forward when a car stops.)

Inertia of direction - An object will stay moving in the same direction unless a force acts on it. (i.e. One's body movement to the side when a car makes a sharp turn.)

Relation between mass and inertia:

- We know that it is easier to push an empty box than a box full of books.
- If we kick a football it flies away. But if we kick a stone of the same size with equal force, it hardly moves.
- Instead of a five-rupee coin if we use a one-rupee coin, we find that a lesser force is required to perform the activity.
- A force that is just enough to cause a small cart to pick up a large velocity will produce a negligible change in the motion of a train. This is because; in comparison to the cart the train has a much lesser tendency to change its state of motion. Accordingly, we say that the train has more inertia than the cart.

Conclusion:

Clearly, heavier or more massive objects offer larger inertia. Quantitatively, the inertia of an object is measured by its mass.

Momentum/Linear Momentum:

- 'The momentum, **p** of an object is defined as the product of its mass, **m** and velocity, **v**.'
- It is expressed as **p = mv**

- Momentum has both direction and magnitude. Its direction is the same as that of velocity, **v**. Therefore, it is a vector quantity.
- The SI unit of momentum is kilogram-metre per second (kg m/s).

Examples:

- During the game of table tennis if the ball hits a player it does not hurt him very much. On the other hand, when a fast moving cricket ball hits a spectator, it may hurt him.
- A truck at rest does not require any attention when parked along a roadside but a moving truck, even at speed as low as 5 m/s, may kill a person standing in its path.
- A small mass, such as a bullet may kill a person when it is fired from a gun.

***

CLASS-IX SCIENCE (PHYSICS)

QUESTION-ANSWER

CHAPTER: 9 FORCE AND LAWS OF MOTION

In-text Questions (T.B Page No.118):

1) Which of the following has more inertia: (a) A rubber ball and a stone of the same size? (b) A bicycle and a train? (c) A five rupees coin and a one-rupee coin?
   Answer: (a) A stone (b) A train (c) A five rupees coin [To be done in Textbook only]
2) In the following example, try to identify the number of times the velocity of the ball changes: "A football player kicks a football to another player of his team who kicks the football towards the goal. The goalkeeper of the opposite team collects the football and kicks it towards a player of his own team". [To be done in Textbook only]
   Answer: 4 times

- 1st time when first football player kicks a football player of his team.
- 2nd time when second player kicks that football towards goal post.
- 3rd time when goal keeper collect that football
- 4th time when that same goal keeper kicks that ball towards a player of his own team.

3) Explain why some of the leaves may get detached from a tree if we vigorously shake its branch.
   Answer: It is because of the 1st Law of Newton. Initially, leaves and tree both are in rest. But when the tree is shaken vigorously, tree comes in motion while leaves have to be in rest and because of that the leaves may get detached from tree.
4) Why do you fall in the forward direction when a moving bus brakes to a stop and fall backwards when it accelerates from rest?
   Answer: When the bus is moving, our upper part of the body and the bus both are motion, and when the bus apply brakes our body tries to be in motion because of inertia of motion and experience a forward push.

- When the bus is in rest, our upper part of the body and the bus both are in rest, and when the bus accelerates, our body tries to be in rest because of inertia of rest and experience a backward push.

***

CLASS-IX SCIENCE (PHYSICS)

QUESTION-ANSWER

CHAPTER: 9 FORCE AND LAWS OF MOTION

[FAIR NOTEBOOK WORK]

In-text Questions (T.B Page No.118):

1) **Which of the following has more inertia: (a) A rubber ball and a stone of the same size? (b) A bicycle and a train? (c) A five rupees coin and a one-rupee coin?**

   Answer: (a) A stone (b) A train (c) A five rupees coin

2) **In the following example, try to identify the number of times the velocity of the ball changes: "A football player kicks a football to another player of his team who kicks the football towards the goal. The goalkeeper of the opposite team collects the football and kicks it towards a player of his own team".**

   Answer: 4 times

- 1st time when first football player kicks a football player of his team.
- 2nd time when second player kicks that football towards goal post.
- 3rd time when goal keeper collect that football
- 4th time when that same goal keeper kicks that ball towards a player of his own team.

3) **Explain why some of the leaves may get detached from a tree if we vigorously shake its branch.**

   Answer:

- It is because of the 1st Law of Newton. Initially, leaves and tree both are in rest. But when the tree is shaken vigorously, tree comes in motion while leaves have to be in rest and because of that the leaves may get detached from tree.

4) **Why do you fall in the forward direction when a moving bus brakes to a stop and fall backwards when it accelerates from rest?**

   Answer:

- When the bus is moving, our upper part of the body and the bus both are motion, and when the bus apply brakes our body tries to be in motion because of inertia of motion and experience a forward push.

- When the bus is in rest, our upper part of the body and the bus both are in rest, and when the bus accelerates, our body tries to be in rest because of inertia of rest and experience a backward push.

NCERT Exercise Questions (T.B Page No.128-129): [Except Q.11 & Q.15]

1) An object experiences a net zero external unbalanced force. Is it possible for the object to be travelling with a non-zero velocity? If yes, state the conditions that must be placed on the magnitude and direction of the velocity. If no, provide a reason.

Answer:

- Yes, when a body moves on the frictionless surface, no unbalanced external force is required. The body will move with non-zero velocity without any external force.

2) When a carpet is beaten with a stick, dust comes out of it. Explain.

Answer:

- Inertia of an object tends to resist any change in its state of rest or state of motion. When a carpet is beaten with a stick, then the carpet comes to motion. But, the dust particles try to retain their state of rest. Hence, the dust particles come out of the carpet.

3) Why is it advised to tie any luggage kept on the roof of a bus with a rope?

Answer:

- When the bus suddenly accelerates from rest and moves forward, it acquires a state of motion. However, the luggage kept on the roof, owing to its inertia, tends to remain in its state of rest and hence may fall down from the roof of the bus. Similarly, when the moving bus stops suddenly, then due to its inertia of motion, the luggage kept on the roof of the bus tends to remain in motion and hence may fall down from the roof of the bus.
- Hence, it is advised to tie the luggage kept on the roof of a bus with a rope so that it does not fall down when the bus starts or stops suddenly.

4) A batsman hits a cricket ball which then rolls on a level ground. After covering a short distance, the ball comes to rest. The ball slows to a stop because

(a) the batsman did not hit the ball hard enough.

(b) velocity is proportional to the force exerted on the ball.

(c) there is a force on the ball opposing the motion.

(d) there is no unbalanced force on the ball, so the ball would want to come to rest.

Answer: (c) There is a force on the ball opposing the motion.

5) **A truck starts from rest and rolls down a hill with a constant acceleration. It travels a distance of 400 m in 20 s. Find its acceleration. Find the force acting on it if its mass is 7 tonnes (Hint: 1 tonne = 1000 kg).**

Answer:

- Given:

Initial velocity, u = 0 (since the truck is initially at rest)

Distance travelled, s = 400 m

Time taken, t = 20 s

Acceleration, a=?

According to the second equation of motion:

$s = ut + ½ at^2$

$\therefore 400 = 0 + ½ \times a \times (20)^2$

$\therefore 400 = ½ \times a \times 400$

$\therefore 400 = 200 \times a$

$\therefore a = 400/200$

$\therefore a = 2\ m/s^2$

Therefore, the acceleration is 2 m/s^2.

- Given:

1 tonne = 1000 kg

Therefore, 7 tonnes = 7000 kg

Mass of truck, m = 7000 kg

From Newton's second law of motion:

Force, F = Mass × Acceleration

F = ma = 7000×2 = 14000 N

Therefore, the force is 14000 N

6) **A stone of 1 kg is thrown with a velocity of 20 m/s across the frozen surface of a lake and comes to rest after travelling a distance of 50 m. What is the force of friction between the stone and the ice?**

Answer:

- Given:

  Initial velocity of the stone, u = 20 m/s

  Final velocity of the stone, v = 0 (finally the stone comes to rest)

  Distance covered by the stone, s = 50 m

  Mass of the stone, m = 1 kg

  According to the third equation of motion:

  $v^2 = u^2 + 2as$, where, a = acceleration

  $\therefore (0)^2 = (20)^2 + 2 \times a \times 50$

  $\therefore 0 = 400 + 100\ a$

  $\therefore - 400 = 100\ a$

  $\therefore a = - 4\ m/s^2$

  From Newton's second law of motion,

  Force, F = Mass ×Acceleration

  F = ma

  $F = 1 \times (- 4) = -4\ N$

  Hence, the force of friction between the stone and the ice is -4 N.

7) An 8000 kg engine pulls a train of 5 wagons, each of 2000 kg, along a horizontal track. If the engine exerts a force of 40000 N and the track offers a friction force of 5000 N, then calculate: (a) the net accelerating force and (b) the acceleration of the train.

Answer:

- **(a)**Given:

  Force exerted by the engine, F = 40000 N

  Frictional force offered by the track, f = 5000 N

  Hence, net accelerating force, $F_{net} = F - f = 40000 - 5000 = 35000\ N$

- **(b)**Let acceleration of the train be a.

  Net accelerating force on the wagons, $F_{net} = 35000\ N$

  Mass of the wagons, m = Mass of a wagon× Number of wagons = 2000 x 5 = 10000 kg

  Mass of an engine, M = 8000 kg

  $F_{net} = (M + m)\ a$

$35000 = (8000 + 10000)\ a$

$\therefore a = \frac{35000}{18000} = 1.94\ m/s^2$

Therefore, the acceleration is 1.94 m/s^2

8) An automobile vehicle has a mass of 1500 kg. What must be the force between the vehicle and road if the vehicle is to be stopped with a negative acceleration of 1.7 m/s^2?

Answer:

- Given:

Mass of the automobile vehicle, m = 1500 kg

Final velocity, v = 0 (finally the automobile stops)

Acceleration of the automobile, a = -1.7 ms^{-2}

From Newton's second law of motion,

Force = Mass × Acceleration = 1500 × (-1.7) = -2550 N

Hence, the force between the automobile and the road is -2550 N, in the direction opposite to the motion of the automobile.

9) What is the momentum of an object of mass m, moving with a velocity v?

Answer: (d) mv

10) Using a horizontal force of 200 N, we intend to move a wooden cabinet across a floor at a constant velocity. What is the friction force that will be exerted on the cabinet?

Answer:

- Given:

Force applied, F = 200 N

Force of friction, f =?

As the wooden cabinet is to move across the floor with a constant velocity, no force (F_{net}) is spent in accelerating the cabinet, i.e., F_{net} = F-f = 0 or, F = f = 200 N

Therefore, the force of friction will be 200 N.

12) According to the third law of motion when we push on an object, the object pushes back on us with an equal and opposite force. If the object is a massive truck parked along the roadside, it will probably not move. A student justifies this by answering

that the two opposite and equal forces cancel each other. Comment on this logic and explain why the truck does not move.

Answer:

- According to the third law of motion when we push an object, the object pushes us back with an equal and opposite force. These two forces are called as action-reaction pair. Action and reaction forces never act on the same object. Hence, they never cancel each other. When we push a massive truck parked along the roadside, it will probably not move because applied force might not be strong enough to overcome the friction between the truck and the road. The justification given by the student is wrong.

13) A hockey ball of mass 200 g travelling at 10 m/s is struck by a hockey stick so as to return it along its original path with a velocity at 5 m/s. Calculate the magnitude of change of momentum occurred in the motion of the hockey ball by the force applied by the hockey stick.

Answer:

- Given:

The mass of the hockey ball, $m=200\ g=0.2\ kg$

The initial velocity of the hockey ball, $u=10\ m/s$

The initial momentum of the hockey ball $Pi=0.2\times10=2\ kg\ m/s$

The final velocity of the hockey ball, $v=-5\ m/s$ (opposite to the original direction)

Final momentum of the hockey ball $Pf=0.2\times(-5)=-1\ kg\ m/s$

Change in the momentum $\Delta P=P_f-P_i=-1-2=-3\ kg\ m/s$

∴The magnitude of change in momentum is 3 kg m/s.

14) A bullet of mass 10 g travelling horizontally with a velocity of 150 m/s strikes a stationary wooden block and comes to rest in 0.03 s. Calculate the distance of penetration of the bullet into the block. Also, calculate the magnitude of the force exerted by the wooden block on the bullet.

Answer:

- Given:

The mass of the bullet $m=10\ g=0.01\ kg$

The initial velocity of the bullet $u=150\ m/s$

The final velocity of the bullet v=0 m/s

Time taken for the bullet to come to rest t=0.03 s

Assuming the wooden block offers constant retardation during the penetration.

Let 'S' be the distance the bullet covered before it comes to rest and 'a' be the acceleration of it.

From the equation of motion,

$$v = u + a\,t \Rightarrow a = \frac{v-u}{t} \Rightarrow a = \frac{0-150}{0.03} = \frac{-150}{0.03} = \frac{-15000}{3} = -5000\ m/s^2$$

Again, from equations of motion,

$$v^2 - u^2 = 2aS \Rightarrow S = \frac{v^2-u^2}{2a} \Rightarrow S = \frac{0^2-150^2}{2(-5000)} = \frac{-150\times150}{-10000} = 2.25\ m$$

The retardation force exerted by the wooden block,

$F = ma \Rightarrow F = 0.01 \times (-5000) = -50\ N$

Hence the magnitude of the force exerted by the wooden block is 50 N and the distance of penetration is 2.25 m

16) An object of mass 100 kg is accelerated uniformly from a velocity of 5 m/s to 8 m/s in 6 s. Calculate the initial and final momentum of the object. Also, find the magnitude of the force exerted on the object.

Answer:

- Given:

The mass of the object m=100 kg

The initial velocity of the object u=5 m/s

The final velocity of the object v=8 m/s

Time taken t=6 s

Initial momentum $P_i = m \times u = 100 \times 5 = 500$ kg m/s

Final momentum $P_f = m \times v = 100 \times 8 = 800$ kg m/s

From Newton's second law of motion, $F = \frac{\Delta P}{\Delta t} = \frac{P_f - P_i}{t} = \frac{800-500}{6} = 50\ N$

∴The initial and final momenta of the object are 500 kg m/s and 800 kg m/s respectively and the magnitude of the force exerted is 50 N.

17) Akhtar, Kiran and Rahul were riding in a motorcar that was moving with a high velocity on an expressway when an insect hit the windshield and got stuck on the windscreen. Akhtar and Kiran started pondering over the situation. Kiran suggested that the insect suffered a greater change in momentum as compared to the change in momentum of the motorcar (because the change in the velocity of the insect was much more than that of the motorcar). Akhtar said that since the motorcar was moving with a larger velocity, it exerted a larger force on the insect. And as a result, the insect died. Rahul while putting an entirely new explanation said that both the motorcar and the insect experienced the same force and a change in their momentum. Comment on these suggestions.

Answer:

- During the impact, the force exerted by the insect and force exerted by the motorcar becomes action and reaction pair. From Newton's third law of motion action and reaction must be equal in magnitude. Hence both the motor car and the insect are gone through the same change in momenta. Therefore, the explanation given by Rahul is correct, while explanations given by Akhtar and Kiran are wrong.

18) How much momentum will a dumb-bell of mass 10 kg transfer to the floor if it falls from a height of 80 cm? Take its downward acceleration to be 10 m/s^2.

Answer:

- Given:

The mass of the dumb-bell m=10 kg

The initial velocity of the dumb-bell u=0 m/s

Distance through which it is falling, S=80 cm=0.8 m

Downward acceleration a=10 m/s^2

From equations of motion,

$v^2-u^2 = 2aS \Rightarrow v = \sqrt{2\times10\times0.8} = 4$ m/s

Momentum with which dumb-bell hits the ground, P = mv = 10 × 4 = 40 kg m/s

∴The momentum transferred by the dumb-bell to the ground is 40 kg m/s.

***

CLASS-IX SCIENCE (PHYSICS)

NOTES (ONLY FOR REFERENCE)

CHAPTER: 9 FORCE AND LAWS OF MOTION

Dynamics: It is the branch of mechanics (physics) which deals with the causes of motion.

Force: It is an external effort in the form of pushing, pulling, stretching, throwing, tearing, swimming, compressing etc.

Note: An external effort can be given by an external agency (Living or Non-living thing).

There are two types of force: (1) Contact force (2) Non-contact force

(1) **Contact force** that requires physical contact to do a physical task or work. For example, a boy is pushing a table.
Example: friction force, compressive force, tensile force

(2) **Non-contact force** that doesn't require any physical contact to do a task or work. For example, a ball is falling towards the earth due to its gravity.
Example: gravitational force, magnetic force, electrostatic force

SI unit of force: Newton (N)

Note: Force is a vector quantity.

List of effects can be produced with the help of force:

- It may move a stationary body.
- It may stop a moving body.
- It may change the speed of a body.
- It may change the direction of a body.
- It may change the size & shape of a body.

Balanced Forces: If two individual forces are of equal magnitude and opposite direction, then the forces are said to be balanced.

Un-balanced Force: If an individual force is not being balanced by force of equal magnitude and opposite direction, then the forces are said to be un-balanced.

Note: Balanced forces do not cause any change in the state of a body.

Note: When any system is under the effect of balanced forces, the net force on the system becomes zero whereas under the effect of un-balanced force, the net force on the system becomes non-zero.

Examples of Balanced forces:

- A person is standing on a ground.
- A book is lying on the table.
- A boy is trying to push the wall.
- Both teams are applying the same forces but in opposite direction in tug of war.
- Two wrestlers are applying the same pushing force on each other.

Examples of Un-balanced forces:

- A rocket is moving upward to go in the space.
- A football moves while it is kicked by a player
- A seesaw oscillates when it is loaded with different weight on both the ends.
- A bike starts moving when it is accelerated with the help of an accelerator.
- A small paper piece moves randomly when it is blown with an air.

Aristotle's Statement:

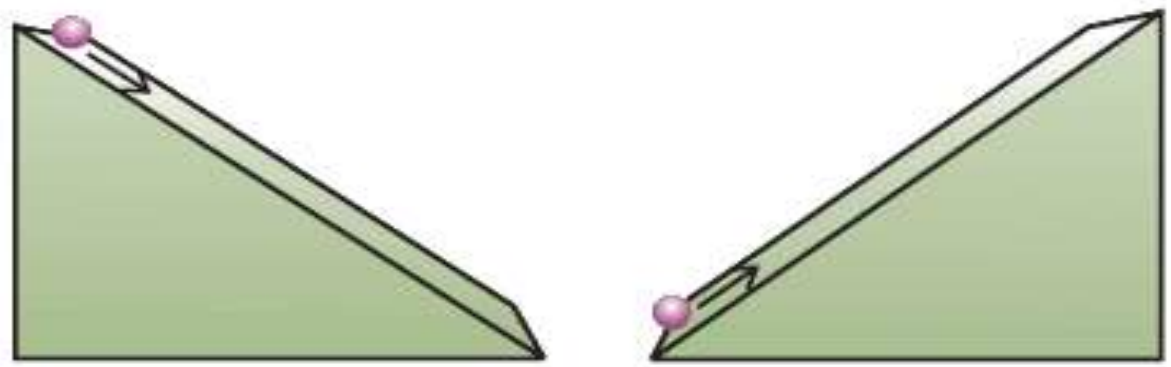
"An External force is required to keep body in uniform motion. A body has a natural state of being in rest."

Aristotle's Fallacy:

- Actually an external force is required to overcome the effect of opposite forces that are produced naturally (for example-friction force).
- If there is no friction between the body and surface on which it is moving then the body will never stop. Also no external force is required.
- Aristotle couldn't explain above discussion.

Galileo's observation:

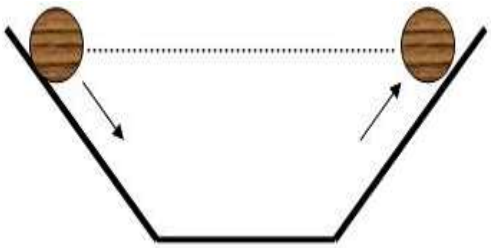
He observed that when a marble rolls down an inclined plane, its velocity increases as shown in figure (a) and its velocity decreases when it climbs up as shown in Fig.(b).



(a) (b)

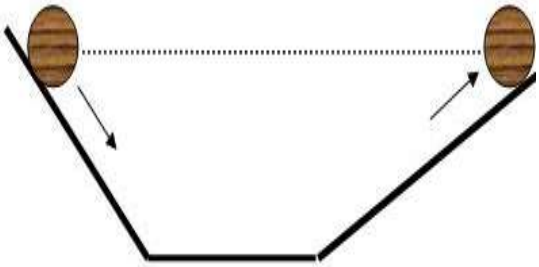
1st Experiment:

Galileo argued that when the marble is released from left, it would roll down the slope and go up on the opposite side to the same height from which it was released. If the inclinations of the planes on both sides are equal then the marble will climb the same distance that it covered while rolling down.



2nd Experiment:

If the angle of inclination of the right-side plane were gradually decreased, then the marble would travel further distances till it reaches the original height.



3rd Experiment:

If the right-side plane were ultimately made horizontal (that is, the slope is reduced to zero), the marble would continue to travel forever (on frictional less surface) trying to reach the same height that it was released from.

Ideas of Galileo:

1) An unbalanced external force is required to initiate the motion (from state of rest).
2) Objects move with a constant speed along a straight line when no unbalanced force (presence of balanced forces) acts on them.
3) In practical situations it is difficult to achieve a zero unbalanced force. This is because of the presence of the frictional force acting opposite to the direction of motion. Thus, in practice the marble stops after travelling some distance.

Statement of Galileo:

"Every object continues to be in its state of rest or uniform motion in a straight line unless it is compelled by some un-balance external force to act."

First law of Newton:

"An object remains in a state of rest or of uniform motion in a straight line unless it is compelled to change that state by an applied un-balanced external force."

- In a qualitative way, the tendency of undisturbed objects to stay at rest or to keep moving with the same velocity is called inertia. This is why, the first law of motion is also known as the law of inertia.

Examples:

- We tend to remain at rest with respect to the seat until the driver applies a braking force to stop the motorcar. With the application of brakes, the car slows down but our body tends to continue in the same state of motion because of its inertia. A sudden application of brakes may thus cause injury to us by impact or collision with the panels in front. Safety belts are worn to prevent such accidents. Safety belts exert a force on our body to make the forward motion slower.
- An opposite experience is encountered when we are standing in a bus and the bus begins to move suddenly. Now we tend to fall backwards. This is because the sudden start of the bus brings motion to the bus as well as to our feet in contact with the floor of the bus. But the rest of our body opposes this motion because of its inertia.
- When a motorcar makes a sharp turn at a high speed, we tend to get thrown to one side. This can again be explained on the basis of the law of inertia. We tend to continue in our straight-line motion. When an unbalanced force is applied by the engine to change the direction of motion of the motorcar, we slip to one side of the seat due to the inertia of our body.
- Initially, leaves and tree both are in rest. But when the tree is shaken vigorously, tree comes in motion while leaves have to be in rest and because of that the leaves may get detached from tree.

- Attempt a sharp horizontal hit at the bottom of the pile using striker. If the hit is strong enough, the bottom coin moves out quickly. Once the lowest coin is removed, the inertia of other coins makes them 'fall' vertically on the table.

Concept of Inertia:

"There is a resistance offered by an object to change its state of motion. If it is at rest it tends to remain at rest; if it is moving it tends to keep moving. This property of an object is called its inertia."

Note: Inertia has no unit because it is just a property, not physical quantity.

Note: Different bodies have different inertia because of their different masses.

Types of Inertia:

Inertia of rest - An object stays where it is placed, and it will stay there until you or something else moves it. (i.e. Dust particles stay at rest until you shake a carpet.)

Inertia of motion - An object will continue at the same speed until a force acts on it. (i.e. Body going forward when a car stops.)

Inertia of direction - An object will stay moving in the same direction unless a force acts on it. (i.e. One's body movement to the side when a car makes a sharp turn.)

Relation between mass and inertia:

- We know that it is easier to push an empty box than a box full of books.
- If we kick a football it flies away. But if we kick a stone of the same size with equal force, it hardly moves.
- Instead of a five-rupee coin if we use a one-rupee coin, we find that a lesser force is required to perform the activity.
- A force that is just enough to cause a small cart to pick up a large velocity will produce a negligible change in the motion of a train. This is because; in comparison to the cart the train has a much lesser tendency to change its state of motion. Accordingly, we say that the train has more inertia than the cart.

Conclusion:

Clearly, heavier or more massive objects offer larger inertia. Quantitatively, the inertia of an object is measured by its mass.

Momentum/Linear Momentum:

"The momentum, (p) of an object is defined as the product of its mass, (m) and velocity, (v)."

- It is expressed as **p = mv**
- Momentum has both direction and magnitude. Its direction is the same as that of velocity, **v**. Therefore, it is a vector quantity.
- The SI unit of momentum is kilogram-metre per second (kg m/s).

Examples:

- During the game of table tennis if the ball hits a player it does not hurt him very much. On the other hand, when a fast moving cricket ball hits a spectator, it may hurt him.
- A truck at rest does not require any attention when parked along a roadside but a moving truck, even at speed as low as 5 m/s, may kill a person standing in its path.
- A small mass, such as a bullet may kill a person when it is fired from a gun.

Second Law of Newton:

"The applied external unbalanced force on a body is directly proportional to the rate of change of momentum of that same body"

In other way, Force ∝ Rate of Change of momentum = $\frac{\Delta p}{\Delta t}$

Derivation of F = ma using 2nd Law:

Suppose an object of mass, m is moving along straight line with an initial velocity.
Now, it is accelerated to velocity v in time t by the help of constant force F.
Initial momentum = mu
Final momentum = mv
Change in momentum = mv – mu = m (v-u)
Rate of change of momentum = $\frac{m(v-u)}{t}$
Now, Force ∝ Rate of change of momentum

$$\therefore F \propto \frac{m(v-u)}{t}$$

$$\therefore F = k\,\frac{m(v-u)}{t}$$

$$\therefore F = kma$$

$$\therefore F = (1)ma\ [\text{Taking } k = 1]$$

$$\therefore F = ma$$

Definition of 1 newton (N) force:

"The force which produces the acceleration of 1 m/s^2 in 1 kg body is called 1N force."

Note: If we measure mass (m) in kg and acceleration (a) in m/s^2 then the unit of a force is written as kg m/s^2.

Therefore we can write 1 N = 1 kg m/s^2

Note: CGS unit of a force is dyne and 1 dyne = 1g cm/s^2

(CGS = Centimeter Gram Second)

Note: 1 N = 10^5 dyne or 1 dyne = 10^{-5} N

Conversion of kg m/s into Ns:

- As you know the equation of force F = ma
- SI unit of a Force is newton (N)
- Now according to equation of a force, N is also written as kg m/s^2 ∴ 1 N = 1 kg m/s^2
- SI unit of a momentum is kg m/s = (kg m ×s)/(s ×s) = (kg m × s)/s^2 = (kg m/s^2) × s = Ns

Impulse: (It is not in NCERT Textbook but it is very important)

"A sudden application of a force for a short duration of time on a body is known as Impulse."

- Impulse is symbolized by $\vec{I}$.
- $\vec{I} = \vec{F}\Delta t$
- It is vector quantity. Its direction is in the direction of an applied external force.
- SI unit of an Impulse is Ns.

Examples of Impulse:

- In baseball, a ball that is only struck with a small part of the bat is not in contact with the bat for a long period of time so the change in momentum, or impulse is small and the ball does not travel very far. However, if the bat strikes the ball squarely, the force is exerted for a longer time resulting in a greater change in momentum, or greater impulse, and the ball travels very far.
- Air bags in cars are designed with impulse, or momentum change principles. When a driver gets into an accident their momentum carries them forward into the steering wheel. By putting an airbag in the car, a smaller force is exerted over a longer period of time to change the momentum of the driver to a stop. Without the airbag, a large force is exerted over a short time causing more damage to the driver.
- A car traveling down the road is slowed down slightly when the brakes are just gently tapped. The force of the brakes is exerted over a small time resulting in a small impulse and a small change in the momentum of the car.
- If you have ever competed in an egg toss competition and done well, you were putting impulse into action. In order to reduce the amount of force on the egg so it doesn't break

when you catch it, you move your hands in the same direction as the egg as you catch it. This action increases the amount of time you apply force on the egg and the amount of force acting on the egg to change its momentum is reduced so the egg will not break.

- A golf ball sits on a tee motionless before the golfer swings the club and strikes the ball. If the ball is struck in the center of the club with a good follow-through, then force is exerted for a longer time resulting in a greater change in momentum, greater impulse, and the ball will travel farther. If the ball is not struck in the center or the club, then the amount of force is only enacted on the ball for a short time resulting in a smaller change in momentum and the ball doesn't go as far.

Newton's second law of motion follows the first law of Newton: (To be Remember)

- When any object is not disturbed by an external force then it will maintain the inertia (Rest, motion or direction) and it will obey first law of motion (law of inertia). Now, when that same object is disturbed to change the inertia by an external force then there will be a change in momentum because of having change in its velocity. So, that object will obey the second law of Newton. In other words, we can say that when first law is there then there will be an absent of second law and so vice versa.

Third law of Newton:

"The third law of motion states that when one object exerts a force on another object, the second object instantaneously exerts a force of same magnitude back on the first object but in opposite direction."

OR

"For every action there is an equal in magnitude and opposite reaction"

Note: These forces act on different objects and never on the same object. So, they do not cancel the effect of each other.

Examples:

- **A man walking on the ground:** While walking, a person pushes the ground in the backward direction, and the ground in return pushes the person in the forward direction, thus making him/her walk.
- **A swimmer** pushes the water backward by his/her hands and in return the water pushes the swimmer forwards, thus enabling him to go forward during swimming.
- **A bird** while flying pushes the air downwards with the help of its wings. Consistent with Newton's third law of motion, the air pushes the bird upwards.
- When **a person is lying on a bed**, his weight is opposed by a reaction force from the bed (assuming it must be there because of Newton's third law of Motion). In turn, both forces cancel each other out, and the person enjoys the equilibrium position.

- When a gun is fired, it exerts a forward force on the bullet. The bullet exerts an equal and opposite force on the gun. This results in the recoil of the gun.
- The third law of motion can also be illustrated when a sailor jumps out of a rowing boat. As the sailor jumps forward, the force on the boat moves itself backwards.
- The propulsion of all rockets, jet engines, deflating balloons, and even squids and octopuses are explained by the same physical principle: Newton's third law of motion. Matter is forcefully ejected from a system, producing an equal and opposite reaction on what remains.
- When we throw a ball on the wall, it will come back because of the reaction force by the wall on that ball.
- The person can stand on the ground because of third law of Newton. An opposite of a weight of a person, the ground will provide normal reaction force to the same person.
- In the game of billiard/snooker, when two balls collide with each other, they will apply the action-reaction forces on each other.

Types of Unit System: **For Knowledge (Not asked in Exam)**

- **FPS** = **F**oot **P**ound **S**econd
- **MKS** = **M**etre **K**ilogram **S**econd
- **CGS** = **C**entimetre **G**ram **S**econd
- **SI** = **S**ystem **I**nternational

***

Class IX

PPT links

Ch No	Name	Link
1	Matter in Our surroundings	DELETED
2	Is Matter Around Us Pure	Part 1 https://drive.google.com/file/d/135x6787onT1wx0N_R5C7u531ayGcY1QI/view?usp=sharing Part 2 https://drive.google.com/file/d/1qzg9FQGOH_IO5wHpBpJYWOiiICIuODtI/view?usp=sharing Numericals https://drive.google.com/file/d/1VnF3SjoQ81rSNui-ut3VS0p6sB1W9c2z/view?usp=sharing
5	Cell – The fundamental unit of life	SLIDES WERE NOT PREPARED. TEACHING WAS CONDUCTED THROUGH PDF BY VISHAL SIR
6	Tissue	https://drive.google.com/file/d/1ksMKgf786IiiguPNEs2YK6WKF3MzbQD4/view?usp=sharing https://drive.google.com/file/d/1Qo2RFNwZNvvR0pe-4FJ1PyRyBJX2SpzQ/view?usp=sharing
8	Motion	https://drive.google.com/file/d/1hp9nlrimLq2fXXJNCAFgrUcGqoAP_daj/view?usp=sharing
9	Force and Laws of Motion	https://drive.google.com/file/d/1IqxP7nHaXjkxytf00ImZFLmbmWiF2CQU/view?usp=sharing