Chapter 1

Physical Quantities and Measurements

Short Answer Questions

1.1: - Can a non-physical quantity be measured? If yes, then how?

Ans: - Non-physical quantities are those quantities that cannot be measured using any tool or instrument. These quantities can be described qualitatively or compared using some pre-determined criteria, indices or through survey techniques.

1.2: - What is measurement? Name its two parts.

Ans:- Measurement is the comparison of an unknown quantity with a standard quantity.

Parts: Numerical value and unit

Example: 5 meters (5 = number, meters = unit)

1.3: - Why do we need a standard unit for measurements?

Ans: - In early days' people used to measure at length using hand or arm, foot or steps. This measurement may result in confusion as the measurement of different people may differ from each other because of different sizes of arms, hands, or steps. To avoid such confusions, there is a need for a standard so that measurement by any person may result the same. This standard of measurement is known as a unit.

1.4:- Write the name of 3 base quantities and 3 derived quantities.

Ans:- **Base Quantities:** Length, Mass, Time

Derived Quantities: Speed, Force, Volume

1.5:- Which SI unit will you use to express the height of your desk?

Ans:- Meter (m), centimeter (cm)

1.6: - Write the name and symbols of all SI base units.

Ans: -

No	Physical Quantity	Unit	Symbol
1.	Length	meter	m
2.	Mass	kilograms	kg
3.	Time	second	S
4.	Temperature	kelvin	K
5.	Electric Current	ampere	A
6.	Intensity Of Light	candela	cd
7.	Amount of substance	mole	mol

1.7: - Why is the prefix used? Name three sub-multiple and three multiple prefixes with their symbols.

Ans:- Prefixes are used to express very large or very small values conveniently.

Sub-multiple:

- milli (m) = 10^{-3}
- micro (μ) = 10^{-6}

- nano (n) = 10^{-9}

Multiple:

- kilo (k) = 10^{3}
- mega (M) = 10^{6}
- giga (G) = 10^{9}

Constructed Response Questions

1.3: - The end of a meter scale is worn out. Where will you place the pencil to measure its length?

Ans: - If the end of a meter scale is worn out, you can place the pencil on any fully visible mark on the scale and note the readings at both ends of the pencil on the meter scale. Subtract the two readings to get the length of the pencil.

1.4: - Why is it better to place the object close to the meter scale?

Ans: - While measuring an object with a meter scale, it is better to place the object close to scale. It reduces chances of parallax error and ensures an accurate reading. parallax error occurs when eye is not directly in line with markings on scale.

1.5: - Why is a standard unit needed to measure a quantity accurately?

Ans.- Standard units are needed to measure quantities correctly because they ensure the measurement are consistent and accurate, and can be understood by the others. It means uniformity and allows measurements to be universally understood and compared.

Comprehensive Questions

1. What is meant by base and derived quantities? Give the names and symbols of SI base Units.

Ans:- **Base Quantities:** Base quantities are the quantities on the basis of which other quantities are expressed

Examples: Length (m), Mass (kg), Time (s)

Derived Quantities: All the quantities which can be described in terms of one or more base Quantities are called derived quantities

Example: Speed is a derived quantity which depends on distance and time which are base quantities.

2: - Give three examples of derived units in SI. How are they derived from base units? Describe briefly

Ans: -

Quantity	Formula	Unit
Area	Length × Width	meter× meter⟶ m^2
Speed	$\frac{Distance}{Time}$	$\frac{meter}{second}$= ms^{-1}
Force	Mass × Acceleration	$kgms^{-2}$ (Newton)

Additional Short Questions

1: - When and who invented Vernier calipers?

Ans: - Vernier Calipers was invented by a French Scientist Pierre Vernier in **1631.**

2: -Write some laboratory safety rules.

Ans: **(i)** Do not taste any chemical unless instructed by your teacher.
(ii) Do not eat drink or play in the laboratory.
(iii) Never work with electricity near water.
(iv) Wash your hands after all laboratory work.

3: - What is least count of an electronic timer?

Ans: An electronic timer can measure time intervals as short as one-ten thousand (1 / 10,000) of a second.

4: - What is meant by parallax error?

Ans: Parallax error occurs due to incorrect position of eye when taking measurement. It can be avoided by keeping eye perpendicular to the scale reading.

6:- What is meant by pitch of the screw gauge?

Ans:- The distance covered by the circular scale in its one complete rotation is called pitch. The pitch of the screw gauge is 1mm.

7: - Why do we use zero correction?

Ans: - In order to get correct zero error correction is added or subtracted from the observed measurement.

8: - What is function of balancing screws in a physical balance?

Ans: - In physical balance balancing screws are used to bring the pointer back to zero position.

9: - What is least count of a screw gauge?

Ans: Least count of a screw gauge is **0.01mm or 0.001cm**

10: - How many divisions are there on its vernier scale.?

Ans: - There are ten divisions on its vernier scale

Chapter 2 Kinematics

Short Answer Questions

1: - Define scalar and vector quantities.

Ans:- **Scalar quantities** are those quantities which can be described completely by its magnitude only.
Vector quantities are those quantities which need magnitude as well as direction to describe it completely.
Examples: Distance (scalar), Displacement (vector)

2.2:- Give 5 examples each for scalar and vector quantities.

Scalar quantities:

1. Distance
2. Speed
3. Mass
4. Temperature
5. Time

Vector quantities:

1. Displacement
2. Velocity
3. Acceleration
4. Force
5. Momentum

2.3: - State head-to-tail rule for addition of vectors.

Ans: - To add a number of vectors, redraw their representative lines such that the head of one line coincides with the tail of the other. The resultant vector is given by a single vector which is directed from the tail of the first vector to the head of last vector.

2.4: - What is distance-time graph and speed-time graph?

Ans: - Distance-time graph A graph showing how distance varies with time. The gradient represents the speed of the object.

Speed-time graph A graph showing how speed varies with time. The gradient represents the acceleration, and the area under the graph gives the distance travelled.

2.5: - Falling objects near the Earth have the same constant acceleration. Does this imply that a heavier object will fall faster than a lighter object?

Ans:- No, the acceleration due to gravity is same for all objects near the Earth, regardless of their mass (ignoring air resistance) . Therefore, both heavier and lighter objects fall at the same rate.

Comprehensive Questions

2.1: - How can a vector be represented graphically? Explain.

Ans:- A vector is represented graphically by a straight line drawn parallel to the direction of the vector. The length of the line gives the magnitude of the vector quantity according to certain scale. The direction of the vector is indicated by an arrow head at one end of this line.

2.2: - Differentiate between:

(i): - **Rest and Motion**

Rest	Motion
Object's position **does not change** with respect to surroundings.	Object's position **changes** with respect to surroundings.

(ii) Speed and Velocity

Speed	Velocity
If a body covers a distance "S" in time "t", its speed "v" will be written as v= S/t **It is a scaler quantity.**	The net displacement of a body in unit time is called velocity. **It is a vector quantity.**

2.3: - Describe different types of motion. Give examples.

1. **Translatory motion:** - The motion of a body in which every particle of the body moves uniformly in the same direction is called Translatory motion. (e.g., motion of a car).
2. **Rotatory motion:** If each point of a body moved around a fixed point (axis), the motion of this body is called rotatory motion. (e.g. motion of fan)
3. **Vibratory motion:** - When a body repeats it's to and fro motion about a fixed position, th motion is called vibratory motion. (e.g., motion of a swing).
4. **Random motion:** - if a body moves in an irregular manner its motion is called random motion. (e.g. Motion of Gas molecules.)

2.4: - Explain the difference between distance and displacement.

Ans: -

Distance	Displacement

The distance is the length of actual path of the motion. It is a scaler quantity.	Displacement is the shortest distance b/w initial and final positions of the motion. It is a vector quantity.

2.6: - Prove that the area under the speed-time graph is equal to distance covered by the object.

Ans: - This is related to long question. For complete answer open the page number of your book **Page no: 43,44** (Area under Speed Time Graph)

2.7: - How equations of motion can be applied to bodies moving under gravity?

Ans: - It should be remembered that while using these equations following points should be kept in Mind.

(i) If a body is released from some height to fall freely its initial velocity v_i will be taken as zero.

(ii) If the body is thrown vertically upward, the value of g will be negative and the final velocity v_f will be zero at the highest point.

Additional Short Questions with Answers

1: - Define acceleration and also write down its unit.

Ans: - Acceleration is defined as the time rate of change of velocity. The SI unit of acceleration is **m/s²**.
Example: A car accelerating at 2 m/s² increases its speed by 2 m/s every second.

2: - Can displacement be greater than distance?

Ans:- **No**, displacement can never be greater than distance.
Example: If a person walks 10 m forward and 5 m back, distance = 15 m, displacement = 5 m.

3:- What does a horizontal line on a distance-time graph represent?

Ans:- It shows that the object is **at rest**.
Example: If a car is not moving for 10 minutes, the distance-time graph will be a flat line.

4: - What does negative acceleration mean?

Ans: - Negative acceleration means the object is **slowing down**.
Example: A ball thrown upward experiences negative acceleration due to gravity.

5: - Define uniform acceleration.

Ans: - If the rate of change of velocity is constant, the acceleration is said to be uniform.
Example: Free fall under gravity is a case of uniform acceleration.

6: - What is instantaneous speed?

Ans: -The speed of a vehicle that is shown by its speedometer at any instant called instantaneous speed. **OR**
Speed of an object at a **particular moment** of time is called **instantaneous speed**.
Example: The speedometer of a car shows instantaneous speed.

7: - Can an object have zero speed but still be accelerating?

Ans:- **Yes**, at the highest point in upward motion, speed is zero but acceleration is not.
Example: A ball thrown upward has zero speed at the top but still has acceleration due to gravity.

8: - Define retardation.

Ans:- Decreasing velocity is called negative acceleration and it is also called retardation.
Example: When brakes are applied, a car slows down — this is retardation.

9: - What is the shape of the speed-time graph for uniform acceleration?

Ans:- It is a **straight sloping line** upward from left to right.

Example: An object starting from rest and gaining speed steadily forms such a graph.

10: - What is the difference between average speed and instantaneous speed?

Ans: -

Average speed	Instantaneous speed
Average speed is total distance divided by total time.	Instantaneous speed is speed at a specific moment.

11: - Define uniform & non-uniform or variable velocity.

Ans: -

Uniform velocity	Non-uniform or variable velocity
The velocity is sadi to be uniform if the speed and direcitn of a moving body does not change.	If the speed and directin or both of them change, it is known as varible or non-uniform velocity.

12: - What is resultant vector?

Ans: - Addition of two or more vectors to get a signle vector, is called resultant vector. It has the same effect as the combined effect of all the vectors to be added.

Chapter 3 Dynamics

Short Answer Questions

3.1: - Define Force and what kind of changes in motion may be produced by a force?

Ans: - Force: A force can push or a pull an object. It stops or changes the magnitude and direction of Velocity of a body.

Changes in motion by a force:

- **(i)** It can push an object.
- **(ii)** It can pull an object.
- **(iii)** It can stop an object.

3.2: - Define contact of force and give its examples.

Ans: - A contact force is fa force that is exerted by one object on the other at the point of contact. Applied, Push and pull forces are contact forces.

3.3: - An object moves with constant velocity in free space. How long will the object continue to move with this velocity?

Ans:- According to Newton First Law, in free space with no external force acting on it, the object will continue move indefinitely at constant velocity.

3.4: - Define impulse of force.

Ans:- Impulse of a force is the product of a force and the time duration it acts.

$$F \times \Delta T = m(\Delta v) = m (v_f - v_i)$$

3.5: - Why has not Newton's first law been proved on the Earth?

Ans:-Newton first law assumes no external force, but on Earth, forces like friction and air resistance are

Always present. These forces prevent true inertial motion and Newton First Law cannot be proved on the Earth.

3.6: - When sitting in a car which suddenly accelerates from rest, you are pushed back into the seat. Why?

Ans: - When a car accelerates, inertia causes your body to remain at rest relative to the seat. That is why you are pushed back into the seat.

3.9: - Define terminal velocity of an object.

Ans:- When upward air resistance balances the downward force of gravity on a falling object, it falls down with constant velocity , it is called terminal velocity.

Constructed Response Questions

3.1: - Two ice skaters weighing 60kg and 80kg push off against each other on a frictionless track. The 60 kg seater gains a velocity of 4ms^{-1} ……..?

Ans: - When two skaters push off, the 60kg skater exerts a force on the 80kg seater, and the 80kg skater exerts an equal and opposite force on the 60kg skater (Newton Third Law). The 60kg skater moves with a velocity of 4ms-^{1}, while the 80kg skater moves in the opposite direction with 3ms$^{-1.}$

Momentum of 6o kg skater = 60×4 = 240kgms^{-1}

Momentum of 80 kg skater = 80 ×(-3)= -240kgms^{-1}

3.2: - Inflatable air bags are installed in the vehicles as safety equipment's, in terms of momentum what is the advantage of airbags over seatbelts?

Ans: - Seatbelts stop the upper body parts of passengers to move forward due to inertia, while airbags increase the time over which the force acts during a collision. It reduces the effect of quick change in momentum. In this way the effect of momentum is greatly reduced.

3.4: - When a cricket ball hits high, a fielder tries to catch it. While holding the ball he/she draws hands backwards. Why?

Ans:- A cricketer draws his hands back to reduce the impact of the ball by increasing the time.

3.6: - Imagine that if friction vanishes suddenly from everything, then what could be the scenario of daily life activities?

Ans: - If friction vanishes suddenly, daily activities like walking driving and holding the objects would become impossible as there would be no resistance to enable motion or grip.

Comprehensive Questions

3.1: - Explain the concept of force by practical examples.

(i) Sometime we apply force on other bodies. For example, when we open a door, we push or pull it by applying force. When we are sitting in a car, we push against the seat as the car turns around a corner.

(ii) Some forces act on us. The example of forces acting on us are the force of gravity acting downward, the force of friction which helps us to walk on the ground and many others.

3.2: - Describe Newton's Laws of Motion

1st Law: A body continues it sate of rest or of uniform motion in a straight line unless acted upon by some external force.

2nd Law: -When a net force acts upon a body, an acceleration is produced in the direction of force and the magnitude of acceleration s directly proportional to the force and inversely proportional to the mass of the body

3rd Law: -For every action, there is always an equal and opposite reaction.

3.3: - Define momentum and express Newton's 2nd law in terms of change in momentum.

Ans: - The momentum of a body is equal to the product of its mass and velocity.

P = mv

Newton second law of motion in terms of change in momentum

As we know that **P = mv**

During a time, interval Δt, the average acceleration a is given by

$$a = \Delta v\, \Delta t = \frac{v_f - v_i}{\Delta t}$$

According to newton second law of motion

$$F = ma = m\,(\frac{\Delta v}{\Delta t})$$

$$F \times \Delta t = m\,(\Delta v) \ldots\ldots I$$

The product **F× Δt** is called as impulse of the force.

Dividing both sides of eq (I) by **Δt, we have** **F =m(Δv)/ Δt)**

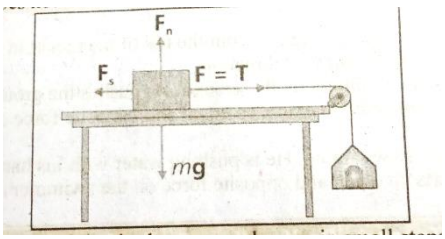
Where m(Δv) is the change in the momentum

3.4: - State and explain the principle of conservation of momentum.

Ans: - **"**If no external force acts on an isolated system, then final total momentum of the system is equal to the initial total momentum of the system**"**. $m_1u_1+m_2u_2=m_1v_1=m_2v_2$

Explanation: - Consider the collision of two identical balls in which the second ball is at rest. When there is collision of two balls there is a transfer of momentum from one ball to another. The ball at rest gains momentum and starts moving whereas the striking ball slows down. If the balls are identical, we will observe that there is total transfer of momentum. The striking balls comes to rest and the other ball starts moving with same speed. It means that second ball gain momentum equal to that lost by one.

3.5: - Describe the motion of block on a table taking into the account the friction between the two surfaces. What is static friction and kinetic friction?



Ans: - The friction between two solid surfaces is called sliding friction which can be divided into two categories.

i. **Static friction**
ii. **Kinetic friction**

Static Friction:

Let us consider motion of a block on a horizontal surface. When a weight is put into a pan, a force F =T equal to the sum of its weight and weight of pan acts on the block. This force tends to pull the block. At the same time an opposing force appears that does not let the block move. This opposing force is static friction F_s.

Kinetic Friction: -

If we go on adding more weights in the pan one by one in small steps, a stage will come when the block starts sliding on the horizontal surface. This is limit of static friction that is equal to the total weights including pan. When the block is sliding, friction still exist. It is known as kinetic friction.

3.6: - Explain the effect of friction on the motion of vehicles in context of tyre surface and braking force.

Ans: - Friction and tyre Surface: -

The friction between the tyre surface and the road surface provides the grip necessary for the vehicle to move, accelerate and turn. A rough tire surface (e.g. tread patterns) increase friction and improve traction, especially on uneven or slippery roads.

Friction and Braking Force: _

When brakes are applied friction between the brake pads and wheel slows the wheels rotation. Simultaneously, friction between the tyre and the road helps the vehicle stop.

Additional Short Answers

1: - What is meant by net force?

Ans: - Net force is the **combined effect** of all the forces acting on an object. It determines the **actual acceleration** of the object.

Example: If two people push a cart from opposite sides with equal force, the net force is zero.

2: - Why do objects slow down on Earth even if no one stops them?

Ans:- Because of **friction and air resistance**, which act as **opposing forces** to the motion.

Example: A ball slows down and stops after rolling on the ground.

3: - Define balanced and unbalanced forces.

- **Balanced forces**: - Two of more forces of equal strength acting in opposite direction on an object, resulting in a net force zero. In this condition objects don't change its state.
- **Unbalanced forces**: A force of a set of forces acting on an object where the net force is not zero. Causing a change in the object's state of motion, speed or direction.

4: - What is inertia?

Ans:- The property of a body to maintain its state of rest of motion is called intertie.

Example: When a car suddenly stops, passengers lurch forward but don't fall due to inertia.

5: - Why is it easier to move an object on wheels than by dragging it?

Ans:- Because **rolling friction is less than sliding friction**, requiring **less force** to move.

Example: Pulling a trolley is easier than dragging a suitcase.

6: - What is the relation between force and acceleration?

Ans: - If magnitude of for1ce is represented by "F" and mas by "m", we can write as it

$a \propto F$, $a \propto \frac{1}{m}$

by combining both of them we can write it as

$a \propto \frac{F}{m}$

$a = \text{constant} \times \frac{F}{m}$

If k=1 then

F=ma

7: - How does friction help us in walking or running?

Ans: To walk or run friction is needed to push the ground backwards. This is our action on the ground. As a reaction the Earth pushes us in forward direction.

8: - Which thing provides necessary centripetal force to coaster cars?

Ans:- While the coaster cars move around the loop, the track provides the centripetal force preventing them to move away from the circle.

9: - Define action and reaction forces with an example.

Ans: - Action is a force exerted by one object on another and reaction is the equal and opposite force exerted by the second object back of the first.

Example: When you walk, your feet push back on the ground **(action)** and the ground pushes you forward **(reaction).**

10: - Why are rubber soles used in shoes?

Ans:- To **increase friction** between the ground and feet, preventing slipping.

Example: Sports shoes have rubber soles for better grip while running.

11: - Define any two types of contact forces.

Ans: - Friction force: -It is the force that resists motion when the surface of a one object comes in contact with the surface of another.

Elastic force: -It is the force that brings certain materials back to their original shape after being deformed.

12: - Define non-contact forces and give examples. OR What is meant by field forces?

Ans: - A non-contact force is called as the force b/w two objects which are not in physical contact. The non-contact forces can work from a distance, that's why it is also called as action-at-a-distance. Due to this property, non-contact forces are also **called field forces.**

13: - What is gravitational force and gravitational field.

Ans: - Gravitational force: -The gravitation field strength is defined as the gravitational force acting on unit mass.

Gravitational field: -The gravitational field is a space around a mass in which another mass experiences a force due to gravitational attraction. This field strength is defined

14: - Define force, electrostatic and magnetic forces.

Ans: - Force: -A force is a push or a pull that starts, stops and changes the magnitude and direction of velocity of a body.

Electrostatic forces: -An electrostatic force acts b/w two charged objects. The opposite charges attract each other like gravitational force. Electrostatic force also known as long-range force.

Magnetic force: -It is a force which a magnet exerts on other magnets and magnetic materials like iron, nickel and cobalt. It can be attractive or repulsive.

15: - Define N(Newton) the unit of force.

Ans: - One Newton is the force which produces an acceleration of $1ms^{-2}$ in a body of mass1kg.

16: - Define mass and weight. OR Differentiate b/w mass and weight.

Ans: -

Mass	weight
The characteristic of a body which determines the magnitude of acceleration produced when a certain force acts upon it is known as mass of the body.	The weight of an object is equal to the force with which the Earth attracts the body towards its center.

17: - Define friction and also give its two types.

Ans: -Friction: -Friction is the force that tends to prevent the bodies from sliding over each other.

Type: -1. Sliding friction **2.** Rolling friction

1: - Sliding friction: - The friction between two solid surfaces is called sliding friction and it has been divided into two categories i.e. Static and kinetic friction.

2: -Rolling friction: -When a body moves with the help of wheels, the friction in this case is known as rolling friction. Rolling friction is much less as compared to the sliding friction.

18: - Define static and kinetic friction.

Ans: -Static friction: -The resisting force b/w the two surfaces before the motion starts is called the static friction. The maximum value of the static friction is called limiting friction.

Kinetic friction: -The friction during motion is called kinetic friction.

19: - What is the principle of conservation of momentum?

Ans: - If no external force acts on an isolated system, the final total momentum of the system is equal to the initial total momentum of the system.

20: - How do frogs can cling to vertical surfaces?

Ans:- Some frogs can cling to a vertical surface because of the static friction between their feet and the surface.

21: - How does hovercraft face very small friction?

Ans: A hovercraft is a kind of a ship that can move over the surface of water and ground both. Air is ejected underneath by powerful fans forming a cushion of air. The hovercraft moves over the cushion of air which offers very small resistance.

22: - What is role of seatbelts in automobiles?

Ans:- When a moving car stops suddenly, the passengers move forward towards the windshield. Seatbelts prevent the passengers from moving. Thus, chance of hitting the passengers against the windshield or steering wheel are produced.

23: - Why do passengers fall in outward direction when a bus takes a sharp turn?

Ans: - When a bus takes sharp turn, the passengers fall in the outward direction, it is due to inertia that they want to continue their motion in a straight line and thus falls outwards.

Chapter 4

Turning Effects of Force

Short Answer Questions

1: - Define like and unlike parallel forces.

Ans:- Like parallel forces are the forces that are parallel to each other and have the same direction.
Unlike Parallel forces are the forces that are parallel to each other but they have opposite direction.

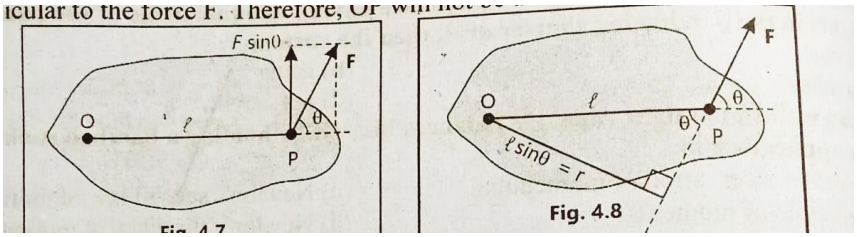
2: - What are rectangular components of a vector and their values?

Ans: The components of a vector which are perpendicular to each other are called rectangular components. The magnitude of rectangular components can be calculated by the following equations. $\mathbf{F_x = F\cos\Theta}$, $\mathbf{F_y = F\sin\Theta}$

3: - What is the line of action of a force?

Ans:- The line along which a force acts is called line of action of a force.

4: - Define the moment of a force. Prove that torque = rFsinθ where θ is an angle between r and F.



Ans:- The turning effect of a force is known as torque or moment of force.

Derivation:

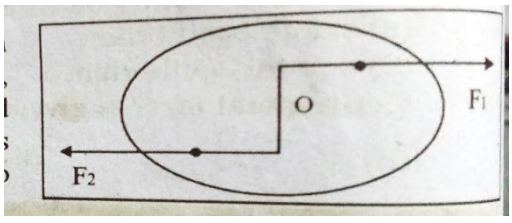
The magnitude of a torque is given by

$$\tau = f \times l$$

where τ (tau) id the torque or moment arm, where f is the force and l is length.
In some cases, the formula of a torque becomes

$$\tau = F \times r\sin\Theta \text{ or } \tau = r \times F\sin\Theta$$

5: - Show that the resultant force is zero but the resultant torque is not zero?



Ans: - If two equal but opposite forces are acting on a body such that their lines of action are not along the same straight line, then under the action of these forces a couple is produced which rotates the body in clockwise direction. So the body is not in equilibrium although the resultant of all forces

is zero but the resultant torque is not zero.

7: - Give an example of a body which is moving yet in equilibrium.

Ans: - A body moving with uniform velocity is in equilibrium. For example a paratrooper coming down with terminal velocity is in equilibrium.

Constructed Response Questions

1: - A car travels at the same speed around two curves with different radii. For which radius does the car experience more centripetal force? Prove your answer

Ans: The car moving on the curve path with the smaller radius experience more centripetal force . The formula of centripetal force is $\mathbf{F_c = mv^2/r}$

From formula it is clear that centripetal force is inversely proportional to radius. As the radius decreases, centripetal force increases.

2: - A ripe mango does not normally fall from the tree. But when the branch of the tree is shaken, the mango falls down easily. Can you tell the reason?

Ans: - A mango does not fall normally because the forces are in equilibrium. Shaking the branch disturbs the equilibrium, and inertia causes the mango to detach and fall.

4: - Why an accelerated body cannot be considered in equilibrium?

Ans:- An accelerated body cannot be in equilibrium because equilibrium requires both net force and net torque to be zero which is not possible during acceleration.

Comprehensive Questions

1: - Explain the principle of moments with an example

Ans:- A body is balanced if the sum of clockwise moments aching on the body is equal to the sum of anticlockwise moments acting on it.

Explanation: When a body is in balanced position the sum of clockwise moments about any point equals the sum of anticlockwise moments about that point.

Total anticlockwise moments = Total clockwise moments

3: - State and explain two conditions of equilibrium.

Ans: - First condition of Equilibrium: A body is said to be in translational equilibrium only if the vector sum of all the external forces acting on it is equal to zero. $\mathbf{\Sigma F = 0}$

Explanation: By newton second law of motion F =ma

If the body is in translational equilibrium, then a=0 therefore net force F should be zero

$\mathbf{\Sigma F=0}$

Let n number of coplanar forces F1+ F2+ F3+…. Fnx = 0 are acting on a body such that F1+F2+F3+…. Fn + 0

$\mathbf{\Sigma F = 0}$

Second Condition of Equilibrium: The Vector sum of all the torques acting on the body about any point must be zero. $\Sigma T = 0$

Explanation: If two equal and opposite forces are acting on a body such that their line of action is not along the same straight line then under the action of these forces a couple is produced which rotates the body about point O.

So, the body is not in equilibrium although the 1st condition of equilibrium is being satisfied.

Therefore, for a body to be completely in equilibrium a second condition is also required. That is no net torque should be acting. So, if the sum all torques acting on a body is zero then the body will be in equilibrium i.e. $\Sigma t = 0$

Additional Short Questions

1: - Why is it easier to rotate a nut using a spanner with a longer handle?

Ans:- A longer handle increases the **perpendicular distance** from the axis, increasing torque.
Example: A large spanner requires less force to tighten or loosen a nut.

2: - What is meant by 'mechanical advantage' in context of rotational systems?

Ans:- It refers to the **ratio of load to effort**, and in rotating systems, it increases with longer lever arms.
Example: A crowbar lifts heavy objects by increasing torque through a longer arm.

3: - Why do tightrope walkers carry a long rod while walking on the rope?

Ans:- The rod **lowers the center of gravity** and increases **moment of inertia**, helping in stability.
This makes them less likely to topple over.

4: - Can a force cause rotation without linear motion? Explain.

Ans:-: Yes, a **couple** (two equal and opposite forces) causes rotation without linear movement.
Example: Turning a screwdriver or steering wheel.

5:- What is the function of the handle position on a door in relation to torque?

Ans:- The handle is placed **far from the hinge** to maximize the moment arm.
This allows more torque with less force.

6: - How is the moment of a couple calculated?

Ans: - Moment of a couple is calculated by this formula
= Force × perpendicular distance between forces.
Example: Two equal forces turning a wheel in opposite directions.

7: - Why does a wider base increase the stability of an object?

Ans:- A wider base ensures that the **line of action of weight** stays within the base during tilts.
Example: A fridge has a broad base to prevent it from tipping over.

8: - What is the effect of mass distribution on rotational motion?

Ans:- If mass is farther from the axis, **moment of inertia increases**, resisting rotation.
Example: A gymnast spreads arms to reduce spinning speed.

9: - How is torque related to angular acceleration?

Ans:- According to rotational form of Newton's 2nd law: **Torque = I × α**
Where I = moment of inertia and α = angular acceleration.

10: - What is the difference between torque and force?

Ans:- Force causes linear motion, while **torque causes rotational motion** about a pivot.
Example: Pushing a box moves it linearly, but turning a tap applies torque.

11: - What is equilibrium? And also mention its types.

Ans: - A body is said to be equilibrium if it has no acceleration.
i. Static Equilibrium

ii. Dynamic Equilibrium

12: - What is centripetal force?

Ans: - The force that causes an object move I a circle at constant speed is called the centripetal force.

$F_c \frac{mv^2}{r}$

13: - Describe the type of equilibrium.

Ans: - 1. Stable equilibrium: - A body is said to be in a state of stable equilibrium, if after a slight tile, it comes back to its original position.

2. Unstable equilibrium: - A body is said to be in a state of unstable equilibrium, if after a slight tilt, it tends to move on further away from its original position.

3. Neutral equilibrium: - A body is said to be in a state of neutral equilibrium, if it comes to rest in its new position after disturbance without any change in its center of gravity.

Chapter 5 Work, Energy And Power

Short Answer Questions

1: - What is the work done on an object that remains at rest when a force is applied on it?

Ans:- If some force is acting on a body but there is no displacement then no work is done.

For example, a man is pushing hard a wall but the wall remains fixed in its place. In this case the work done will be zero.

Mathematically

As we know that **W = F × S**

In this case **S = 0** So, **F × 0 = 0**

2: - A slow-moving car may have more kinetic energy than a fast-moving motorcycle. How is this possible?

Ans: - A slow moving car can have more kinetic energy than a fast motorcycle because kinetic energy depends on mass and speed. A car large mass can make up for its lower speed, resulting in more energy compared to a lighter motorcycle moving faster. **For example** a car of mass 2000kg moving with speed of $10ms^{-1}$.

$$E_k = \frac{1}{2}mv^2$$

$$= \frac{1}{2}(2000)(10)^2$$

$$E_k = 100{,}000\ J$$

4: - A woman runs up a flight of stairs. The gain in her gravitational potential energy is 4500 J. If she runs up the same stairs with twice the speed, what will be her gain in potential energy?

Ans:- As we know that gravitational potential energy is given as

P.E = mgh The gain in potential energy depends only on height, mass and gravity not speed.

So the gain is still 4500**J.**

5: - Define work and its SI unit (Joule).

Ans:- **Work:** -Work is defined as the product of the magnitude of force and the distance covered in the direction of force.

The S.I unit of work is Joule (J).

Joule: - One Joule work is done when a force of one newton acting on a body moves it through a distance of one meter in its own direction. **1 J = 1N×1m**

7: - Define kinetic energy and also derive expression for the kinetic energy.

Ans: - Kinetic energy: - The kinetic energy of a body is the energy that a body possesses by virtue of its motion.

Suppose a body of mass m is moving with with velocity v. An opposing force F acting on the body through a distance S brings it to rest. Then

E_k= work done = F × S As **F = ma** and **S** $= v_{av} \times$ **time** $= \left(\frac{v+0}{2}\right) \times t$

$= \frac{v}{2} \times t$

Hence $E_k = ma \times \frac{vt}{2}$

$= \frac{1}{2} ma \times vt$

We know $a = \frac{v}{t}$

Thus $E_k = \frac{1}{2} m\left(\frac{v}{t}\right) \times vt$

$E_k = \frac{1}{2} mv^2$

8: - Define efficiency of a working system. Why a system cannot have 100% efficiency?

Ans: - The ratio of useful output energy and the total input energy is called the efficiency of a working system. **Efficiency = Useful output energy/Total input energy**

It is found that energy output is always less than energy input. During any conversion of energy, some energy is wasted in the form of heat. No device has yet been invented that may convert all the input energy into the required output. That is why a system cannot have an efficiency of **!00%.**

9: - What is power? Define the unit(Watt) used for it.

Ans: - Power is defined as the rate of doing work

Power $= \frac{Work}{time}$, $P = \frac{W}{t}$

Its SI unit is **watt (W)**.

Watt: One watt is defined as work done at the rate of one joule per second.

Constructed Response Questions

1: - Can the kinetic energy of a body ever be negative?

Ans: - Kinetic Energy of a body cannot be negative. It has either positive value or zero.

As we know that $E_k = 1 / 2mv^2$

Kinetic Energy of a body depends upon mass of body m which is a constant and always has positive value and square of velocity as square of negative value is always positive. So, the kinetic energy of a body cannot be negative .

3: - A car is moving along a curved road at constant speed. Does its kinetic energy change?

Ans:- **NO,** the kinetic energy does not change:

Since, K.E = $\frac{1}{2}mv^2$

This equation shows that kinetic energy depends on mass and speed. It does not depend upon its direction. Since the car speed is constant its kinetic energy remains the same even if it moves along the curved path.

4: - Comment on the statement: "An object has one joule of potential energy."

Ans:- An object has one joule of potential energy means that body has capacity to do work of one joule it means a force of one newton is required to raise it through a height of 1m. 1J = 1N× 1m

6: - While playing cricket on a street, the ball smashes a windowpane. Describe the energy changes in this event

Ans:- When the cricket ball hits the window:

(i) Kinetic energy of the ball is transferred to the ball.

(ii) Part of the energy deforms or breaks the window.

(iii) Some energy turns into sound (like smashing noise)

(iv) A small amount is convinced to heat due to friction.

7: - A man rowing boat upstream is at rest with respect to the shore. Is he doing work?

Ans:- No, he is doing no work. Work is done when a force is applied and body covers some distance under the action of this force. In this case the man is exerting force on the water to move the boat upstream but he is at rest with respect to the shore so his work done will be zero.

Comprehensive Questions

1: - What is meant by kinetic energy? State its unit. Describe how it is determined.

Ans:- The **Kinetic Energy** of a body is the energy that a body possesses by virtue of its motion.

S.I Unit: Joule

Explanation:

Suppose a body of mass m is moving with with velocity v. An opposing force F acting on the body through a distance S brings it to rest. Then **(For equation see question no 7 in short answer question)**

2: - State the law of conservation of energy. Explain it with the help of an example of a body falling from certain height in terms of kinetic energy and potential energy.

Ans: - This is related to a **long Question**, so write the complete topic of **Conservation of Energy** in **Page No # 112.**

4: - Explain what is meant by efficiency of a machine. Why there is a limit for the efficiency of a machine.

Ans: -. The ratio of useful output energy and the total input energy is called the efficiency of a working system. **Efficiency = Useful output energy/Total input energy**

Limitation of Efficiency of a System: It is found the energy is always less than the energy input. During any energy conversion of energy, some energy is wasted in the form of heat. No device has yet been invented that may convert all the energy into the required output. That is why a system cannot have an efficiency of 100%. As the energy losses are inevitable in the working of a machine, hence, an ideal or perpetual machine cannot be constructed.

Additional Short Questions

2: - What is an ideal machine?

Ans: - A machine with its output equals to input is called an ideal machine with an efficiency of 100%.

3: - How much energy can be stored in a Bow?

Ans: - A stretched bow stores energy, which is transferred to the narrow as it shot. Some bows store enough energy to shot an arrow even 1km away.

5:- Does potential energy a train change during the motion of a roller coaster?

Ans:- The train changes potential energy every moment in the roller coaster.

6: - What do you know about Radioactive fallout of Chernobyl?

Ans: - The radioactive fallout from the 1986 Chernobyl nuclear accident in Russia (1986) affected people, livestock and crops. Although only 31 people died from direct exposure about 600,000 people were significantly exposed to fallout.

8: - How does our body get energy?

Ans: - Our body gets energy stored in the food. The energy stored in food is chemical potential energy

9: - Why do we need energy?

Ans: - We need energy for doing work and other activities.

10: - Name a device that convert electrical energy into mechanical energy?

Ans: - Generator is a device that converts mechanical energy into electrical energy.

11: - What is meant by perpetual energy machines?

Ans: - It is a hypothetical machine that can do work indefinitely, without any external source of energy. A perpetual machine would have to generate more energy than it consumes, effectively producing energy from nothing, which is impossible.

Chapter 6 Mechanical Properties of Matter

Short Answer Questions

1: - Why do heavy animals like an elephant have a large area of the foot?

Ans: Elephants have large feet to spread their weight, reducing pressure and preventing sinking. This also improves balance and stability.

3: - Why is it painful to walk barefoot on pebbles?

Ans: - Walking barefoot on pebbles is painful because the small hard stones press into a small area of your foot increasing pressure and causing discomfort.

4: - State Pascal's law. Give two application of Pascal's law.

Ans: - Pascal's Law: When pressure is applied at one point in any enclosed fluid it is transmitted equally to all parts of fluid without loss.

Applications of Pascal's Law:

(i) Hydraulic Press: -A hydraulic press works on these principal Pascal's law. Cotton bale or any other object to be compressed is placed over the large piston. A force $\mathbf{F_1}$ is applied on the smaller piston. The pressure P is produced by smaller piston is transmitted equally to large

piston. A much greater force F_2 acts on it. This force lifts the large piston and compresses the cotton bale. $F_2 = F_1 / A_1 . A_2$

(ii) hydraulic brakes of Vehicles: In Such types of brakes cylinders with pistons are attached to the wheels. Oil is filled in this piston. When pedal is pushed down the piston applies pressure on the liquid in the master cylinder. The liquid pressure is transmitted equally to the larger pistons of other cylinders. This pressure causes these pistons to move outward pressing the brake pads towards brake discs or brake drums.

5: - What do you mean by elasticity of a solid?

Ans: - An object is said to be elastic if after removal of the deforming force it restores to its original size and shape. This property of materials is known as elasticity.

Example: When a tennis ball is hit by a racket the shapes of tennis ball and also racket strings are distorted or deformed. They regain their original shape after bouncing of the ball by the racket removed.

7:- Distinguish between force and pressure.

Ans:-

Force	Pressure
Force is a push or pull of an object measured in newtons**(N).**	Pressure is the force applied per unit area and measured in pascals **(Pa)**
Force acts on an object	Pressure acts on a surface area
It can change its motion.	It describes how concentrated the force is on a surface

8: What is the relationship between liquid pressure and the depth of the liquid?

Ans: - Liquid pressure is given by: **P = *p*gh**

This relation shows that liquid pressure increases with depth. The value of pressure depends on the depth and density of the liquid.

10: - State the basic principle used in the hydraulic brake system of the automobiles.

Ans: - The basic principle used in the hydraulic brake system of automobiles is Pascals law, which states that pressure applied to a confined fluid is transmitted equally in all directions.

Constructed Questions and Answers

1: - A spring having spring constant "k" hangs vertically……is not exceeded.
For each arrangement, complete the table by determining.
(i). the total extension in terms of "x"
(ii). the spring constant in terms of "k".

Ans: -

Arrangements	'K'	'x'
	$\frac{1}{Keq} = \frac{1}{K_1} + \frac{1}{K_2}$ $\frac{1}{Keq} = \frac{1}{K} + \frac{1}{K}$ $\frac{1}{Keq} = \frac{1+1}{K} = \frac{2}{K}$	$x = x_1 + x_2$ $x = \frac{L}{K} + L$ $x = \frac{L+L}{K}$

	$\frac{1}{Keq} = K + K$ $\frac{1}{Keq} = 2K$	$x = \frac{2L}{K}$ $x = \frac{L}{Keq}$ $x = \frac{L}{2k}$

2: - Why are springs made of steel instead of iron? Why?

Ans: - Springs are made of steel instead of iron because steel is stronger more elastic durable and

5: - What will happen to the pressure in all parts of a confined liquid if pressure is increased in one part? Give an example from your daily life where such a principle is applied.

Ans: - If pressure is increased in one part of a confined liquid than the pressure is increased in all parts equally. This is explained from Pascal's law.

Example: In **Hydraulic brakes** when force is applied to the brake pedal than pressure is transmitted equally to the brake fluid allowing all breaks to act simultaneously.

6: - If some air remains trapped within the top of the mercury column of the barometer, which is supposed to be vacuum, how would it affect the height of the mercury column?

Ans: - If air is trapped at the top of mercury column than it exerts additional pressure on the mercury. This reduces the giraffe's neck has a special design in internal blood vessels that allows it to bend and support the neck effectively. This design helps the giraffe to raise its neck suddenly without any difficulty.

8: - The end of the glass tube used in a simple barometer is not properly sealed, and some leakage is present. What will be its effect?

Ans: - A leak in the barometer tube will cause an inaccurate readings and lower mercury level.

Comprehensive Questions

1: - What is Hooke's law? Give three applications of this law.

Ans: - See short answers question, Question no 6.

Applications:

i. Spring Scales. Spring scales use the extension of compression of a spring to determine the weight of objects. In a common spring balance, the extension or elongation produced is a measure of the weight.

ii. Balance wheel of mechanical clocks. The balance wheel in mechanical clocks use spring to control the back and forth motion that regulates the speed of the hands of the clock.

iii. Galvanometer. Galvanometer is a current detecting device. It makes use of a tiny spring called hair spring which provides electrical connections to the galvanometer coil and also restores the pointer back to zero position.

3: - Describe Pascal's Law. State its applications with examples.

Ans: - See short answer question Q no 4

4: - On what factors does the pressure of a liquid in a container depend? How is it measured?

Ans: Liquid exerts pressure in all directions. The pressure of a liquid acts in all directions. It is observed that liquid pressure depends upon both depth and density of liquid.

Liquid Pressure = Force / Area

$P = \frac{F}{A}$

$= \frac{W}{A}$ F=W

$= \frac{mg}{A}$ W=mg

$= p\frac{Vg}{A}$ As mass =Density × volume (m=p V)

$= p\frac{Ahg}{A}$ As Volume=Area× Height (V=Ah)

P = pgh

This is the required relation for liquid pressure which shows that liquid pressure increases with depth. The value of pressure depends on the depth and density of object.

Additional Questions

1: - If the helical spring experiment is repeated with a stiffer spring (high value of k) what will be the effect on the graph?

Ans: - The graph is a straight line passing through the origin but the slope of the graph will be steeper. This is because a stiffer spring requires more force to produce the same amount of extension, indicating a higher spring constant.

2: - How can you measure the volume if the object is lighter than the liquid?

Ans: - To measure the volume of an object less dense than water, you can use displacement method. Submerge the object in water and the volume of water displaced is equal to the volume of the object. Measure the volume of water before and after submerging the objects to determine its volume.

3: - Can we use water in place of mercury to construct a barometer? Explain why.

Ans: - No, water is not suitable to be used in barometer. The reason is that mercury is 13.6 times denser than water. At normal atmospheric pressure height of water column in glass tube would be 13.6 times less than that of mercury.

4: - What is helical Spring?

Ans: - A spring of helical or spiral is called helical spring. Its length is greater than its diameter. Helical spring is used to prove Hooks law experimentally.

5: - Which type of liquids form layers on mixing?

Ans: - Immiscible liquids of different densities form layers when they are mixed.

6: - When a bottle of soda is opened gas comes out. Why?

Ans: - Some liquids under pressure can dissolve more gas than a liquid to a lower pressure. When we open bottle of soda water the pressure in the bottle is decreased. The liquid can no longer hold as much gas. The dissolved gas comes out of the solution and rises to surface of the liquid in form of bubbles.

7: - What is elasticity?

Ans: Elasticity is the property of solid by which they come back to their original shape when deforming force ceases to act.

8: - Define pressure and atmospheric pressure.

Ans: Pressure: -Pressure is the force that acts normally on unit area of a surface. Its SI unit is Pascal

and 1 Pascal is equal to Nm^{-2}.

Atmospheric pressure: Atmospheric pressure is the force exerted by the atmosphere acting on unit area of the Earth's surface. It can be measured by the column of mercury which the atmospheric pressure can support.

9: - What is force multiplier?

Ans: - In hydraulic press when a small force is applied on small piston, result into a large force of larger piston. Such a system called known force multiplier.

10: - Define density and give its formula. Also tell how it can be measured?

Ans: - Density of a substance is defined as its mass per unit volume. $Density \frac{Mass}{Volume}$

Density of a substance can be determined by measuring its mass and volume. The mass can be easily measured by physical balance.

11: - What is deforming force and extension.

An: - Deforming force: -When an external force is applied on an object, it can change its size and shape, such force is called deforming force.

Extension: -An appropriate force applied to a spring can increase its length called extension or cause compression.

12: - Why a bulldozer has large pillar tracks instead of Wheels?

Ans: - A bulldozer has large pillars tracks instead of wheels because tracks provide better weight distribution, improved traction greater stability and the ability to handle uneven or soft terrains effectively.

13: - Would you exert more, same or less pressure on the ground if you stand on one foot instead of two feet?

Ans: - Yes, would exert more pressure on the ground if you stand in one foot instead of two. This is because the force of your weight is spread over a smaller area.

Chapter 7 Thermal Properties of Matter

Short Answer Questions

4: - What is the effect of raising the temperature of a liquid?

Ans: - Raising the temperature of a liquid increases the kinetic energy of its molecules making their motion more vigorous. This increased motion weakens the intermolecular forces further.

5:- What is meant by the temperature of a body?

Ans:- Temperature is a physical quantity that determines the degree of hotness or coldness of a body. It also determines the direction of internal energy flow from one object to another.

7: - What is meant by the thermometric property of a substance? Enlist some thermometric properties.

Ans:- A thermometric property is a characteristic of a substance that changes with temperature.
Some thermometric properties are as follows:
Good heat conductivity. Features accurate temperature readings.

Quick response to temperature changes: Enables fast measurement.
High boiling point: Prevents vaporization at high temperature.
low freezing Point: Allows measurement of very low temperature.

8:- State the main scales used for the measurement of temperature. How are they related with each other.?

Ans:- Temperature is measured using three main scales: Celsius (C), Fahrenheit (F), and kelvin (K).

Celsius Scale: The ice point is **0°C** and the steam point is **100°C** with the neutral divided into **100** equal parts. Each division is 1°C.

Fahrenheit Scale: The ice point is **32**°F and the steam point is **212°F** with the interval divided into 100 equal parts. Each division is **1°F.**

Kelvin Scale: The ice point is **273 K** and the steam point is **373K** wit the interval divided into **100** equal parts. The kelvin scale starts at absolute zero **(O K)** equivalent to **-273**°C where molecular motion ceases.

Relationship between Scales:

The size of **1**°C is equal to **1K** but they have different starting points.

The relationship between Celsius and Fahrenheit is

$$T_F = 9 / 5 \times T_C + 32$$

Relationship between Kelvin and Celsius scale is

$$T_K = T_C + 273$$

13: - Define heat and internal energy. OR Distinguish between heat and internal energy.

Heat	Internal Energy
Heat is the energy transferred between two bodies due to difference in temperature between two bodies.	Internal energy is the sum of the kinetic and potential energies of the molecules within a substance.
The term **heat** is used only when referring to energy in transit	A substance contains internal energy, not heat.

Constructed Response Questions:

1: - Is kinetic molecular theory of matter applicable to the plasma state of matter? Describe briefly.

Ans:- Yes**,** the kinetic molecular theory applies to the plasma. In plasma particles (ions and electrons) move vigorously and their kinetic energy increase with heating similar to solids liquids and gases.

2: - Why is mercury usually preferred to alcohol as a thermometric liquid? Why is alcohol not suitable for all thermometers?

Ans:-. Mercury is preferred to alcohol as a thermometer liquid because it is opaque and easily visible due to its silvery color making it easier to red the temperature. Alcohol though usable must be colored to make it visible.

3:- Guess the equivalent temperature of 373 K on Celsius and Fahrenheit scales.

Ans: Water is not suitable for use in temperature because it boils at **373 K (100°C)** at standard atmospheric pressure which limits the upper temperature range of the thermometer.

373 K equals to **100 ˚ C** or **212 ˚F.**

Temperature rise for 2 liters of water = 2 ˚**C** / 2= 1 ˚**C**

So, the temperature rise will be 1 ˚**C.**

6:- Why are there no negative numbers on the Kelvin scale?

Ans:- There are no negative numbers on the kelvin scale because it starts at absolute zero, the lowest possible temperature where molecular motion stops.

9:- Which is greater: 1°C or 1°F?

Ans:- 1 ˚**C** is a larger temperature change than 1 ˚**F** because the Celsius scale divides the temperature range between freezing and boiling of water into 100 equal parts while the Fahrenheit scale divides it into 180 equal parts.

10: - Not all molecules in a gas have same speed because of the random nature of molecular motion. Molecules collide with each other and exchange energy leading to a distribution of speeds. Some molecules move faster some slower and the majority have speeds around an average value.

13:- Discuss whether the Sun matters.

Ans:- The Sun is matter because it consists of plasma, which is state of matter. Plasma is formed when gas is ionized as seen in the Sun and other stars as well as in plasma TV and gas discharge tubes. Therefore, the Sun being in plasma state is made up of matter.

Comprehensive Questions

2: - What is temperature? How is it measured? Describe construction of mercury-in-glass thermometer.

Ans: Temperature is a physical quantity that determines the degree of hotness or coldness of a body. It also determines the direction of internal energy flow from one object to another.

Mercury in glass thermometer: A liquid in glass thermometer has a narrow and uniform capillary tube having a small bulb filled with mercury or alcohol as its lower end. The thin wall of the glass tube allows quick conduction through glass to the liquid from a hot object whose temperature is to be measured. Measured being metal is a good conductor and hence responds quickly to change in temperature. The small amount of liquid also responds quickly to a change in temperature. For greater accuracy alcohol can be used as its expansively is six times more than mercury but it has range limitation to higher temperature measurements due to it slow boiling points (78C)

3: - Compare the three scales used for measuring temperature.

Three different temperature scales are

(i) Celsius Scale or centigrade scale

(ii) Fahrenheit Scale

(iii) Kelvin Scale

Celsius Scale: On Celsius scale the interval between lower and upper fixed points is divided inti 180 equal parts and each part is called one-degree Celsius scale. The lower fixed point is marked as (0C) and upper fixed point is marked as 100C.

Fahrenheit Scale: On Fahrenheit scale the interval between lower and upper fixed point is divided into 180 equal parts and each part is called one degree Fahrenheit. This lower fixed point is marked as **32˚F** and upper fixed point is marked as **212 ˚F.**

Kelvin Scale: On Kelvin scales the interval between lower and upper fixed point is divided into **100 equal** Parts and each part is called one kelvin. The lower fixed point is **273k** and upper fixed point is marked as **373k,**

Conversion of Celsius to Fahrenheit scale: $F = 9/5 \times C + 32$

Conversion of Fahrenheit to Celsius Scale: $C=5/9 (F - 32)$

Conversion of Celsius to kelvin scale: $T_k = T_c + 273$

Additional Questions.

3: - What is thermocouple thermometer?

Ans: - Thermocouple thermometer is based on the flow of electric current b/w two junctions of two wires of different materials due to difference of temperature at the junctions.

4: - What is thermometer?

Ans: - For the exact measurement of the hotness and coldness, we need an instrument called a thermometer.

5: - Why the walls of thermometer bulb are thin?

Ans: - The walls of thermometer bulb are thin to allow heat to transfer easily between liquid in bulb and object being measured.

6: - Why the inner bore of thermometer must be narrow?

Ans: - The inner bore of thermometer must be narrow to make small changes in mercury volume more noticeable allowing for precise temperature readings.

Chapter 8 Magnetism

Short Answer Questions

1:- What are temporary and permanent magnets?

Ans:- Temporary Magnets are magnets that work only in the presence of a magnetic field ; such as that of a permanent magnet. Once the magnetic field is removed, they lose their magnetic properties.

Example: Include soft iron paper clips office pins iron nails and electromagnets.

Permanent Magnets: They are on the other hand retain their magnetic properties permanently. They can be natural or artificially made by placing materials like steel or special alloys in a strong magnetic field for a sufficient time.

Examples: Cobalt, alnico, and ferrite.

2: - Define magnetic field of a magnet.

Ans: - The magnetic field of a magnet is the region around a magnet where another magnetic object experiences a force. It is the area in which the magnet exerts an attractive or repulsive force on other magnetic poles or materials.

3:- What are magnetic lines of force?

Ans:- Magnetic lines of force are the imaginary lines that represent the magnetic field around a magnet. They can be drawn using a small compass, where the needle aligns with the magnetic field pattern which is represented by magnetic lines of force.

4: - Name some uses of paramagnets and electromagnets? Give examples.

Uses of Permanent Magnets:

Ans: Essential Parts of D.C motors A.C, and D.C electric generators.
Used in moving coil Loudspeakers.
Commonly used in door catchers.
Magnetic strips are used in refrigerators and freezer doors to keep them closed them tightly.

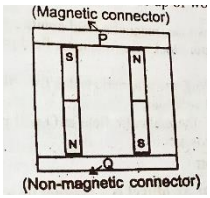
Uses of Electromagnets:

(i) Electric Bells
(ii) Telephone receivers
(iii) Circuit breakers
(iv) Cranes
(v) Reed Switches

Constructed Response Questions

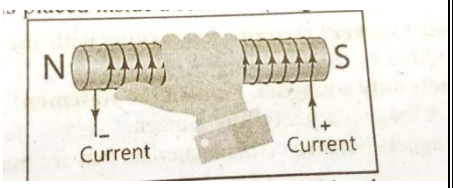
1: - Two bar magnets are stored in a wooden box. Label the poles of the magnets and identify P and Q objects.

Ans: - Two bar magnets are stored in a wooden box with North Pole of one magnet faces the south Pole of the other (N-S and S-N). In the figure P is the magnetic connector which is used to preserve magnetism and Q is a non-magnetic connector made up of wood or plastic.



2: - A steel bar has to be magnetized in a solenoid such that end A becomes N-pole. Draw circuit diagram.

Ans:- A steel bar to be magnetized is placed inside a solenoid (long coil of wire). When direct current is passed through the solenoid the steel bar becomes a magnet such that ends A of a bar becomes **N-Pole** and end **B** becomes **S-pole.**



4: - Can magnetic field produce electric current? Give example.

Ans:- Yes, a changing magnetic flux produces an electric current as per Faraday law
Example: In an electric generator a coil moves through a magnetic field causing a change in

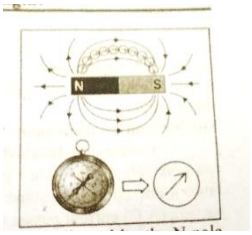
◆ Comprehensive Questions:

1:- How to identify a magnet from a magnetic material?

Ans:- Identification of a Magnet: to identify whether an object is magnet or simply a magnetic material we can bring its one end its one end close to any pole of the suspended bar magnet. If it is attracted then we can conclude that the end of the object is either of material. Then we should bring the same end of the object close to another end of the suspended magnet. If the object is again attracted it is not a magnet but it is a magnetic material

2:- Describe strength of magnetic field using field lines with diagrams.

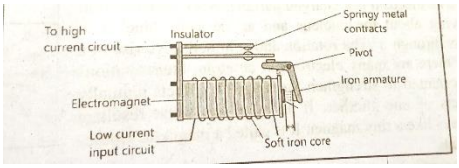
Ans:- **Magnetic Field Strength:** The strength of the magnetic field is proportional to the number of magnetic lines of force passing through unit area are placed perpendicular to the lines. Thus, the magnetic field is stronger in regions where the field lines are relatively are closed together and weaker when they are far apart.



In case the two magnets are placed close to each other their combined magnetic field can also be drawn by using the compass needle. The pattern of the combined magnetic field of two magnets lying with different orientations. Point x is called a neutral point because the filed due to one magnet cancels out that due to another magnet.

3: - What is a circuit breaker? Explain with diagram.

Ans:- A circuit breaker is designed to pass a certain maximum current through it safely. If the current becomes excessive it switches Off the circuit. Thus, electric appliance is protected from burning. Inside a circuit breaker the current flows along a copper strip, through the iron armature and coil of the electromagnet. The electromagnet attracts the armature. If the current is large enough the armature is detached from the copper strip and circuit breaks.



4: - A magnet attracts only a magnet. Explain.

Ans:- The statement "A magnet attracts only a magnet is not entirely correct because magnets attract me only other magnets but also certain materials that are magnetic in nature.

Explanation: To identify whether an object is a magnet or a magnetic material we can bring it's one end close to any pole of a suspended bar magnet. If it is attracted, then we can conclude that the end of the object is either of opposite pole to that of the suspended magnet or it is simply a magnetic material. Then we should bring the same end of the object close to another end of suspended magnet. if the object is again attracted it is not a magnet but a magnetic material. If it is repelled by other of the suspended magnet, then the object is a magnet. So, we can **Conclude** that the repulsion between like poles is like a real test to identify a magnet.

Additional Short Questions

1:- What do you know about lodestone or magnetite?

Ans: Over **1000** years ago Greeks discovered a rock called lodestone or magnetite that could attract materials that contained iron. Also, if suspended from a string to rotate freely it would always settle in north-south direction. This unique property led to form the basis of compass which was later on used for navigation on land and at sea

2:- Give two Uses of Electromagnets?

Ans:- **(i)** Electromagnets are widely used in recordings technology's recording mediums are audio/video magnetic tapes head disks of computers and other data storing devices.

(ii) Soft iron is used to protect sensitive magnetic devices from external magnetic fields.

3: - What are magnetic Poles?

Ans: - Magnets has two poles

(i) North Pole

(ii) South Pole

Like poles repel each other and unlike poles attract each other.

4:- How does Maglev trains Or bullet trains work?

Ans:- A wonderful use of electromagnets can be seen in the maglev trains. The maglev stands for a magnetically levitated train. A maglev uses forces that arise from induced magnetism to levitate or float a few centimeters above the guideways. That is why it does not need wheels and faces no friction. In Japan it is known as bullet train that can run up to a speed of **400km/s.** To push the train forward propulsion electromagnets are installed along the guideways an train. By push and pull of these magnets the train moves forward.

Chapter 9 Nature of Science

1: - State in your own words, what is science? Write its two main groups.

Ans:- Science is a collective knowledge about the natural phenomena processes and events occurring around us. With the passage of natural philosophy or science was divided into two main branches.

i. Physical Science: It deals with the study of non-living things.

ii. Biological Science: It deals with the study of living things.

2: - What is Physics all about? Name some of its branches.

Ans:- Physics is a fundamental branch of science which deals with matter energy space time and their mutual relationships.

The main branches of physics include mechanics heat and thermodynamics electricity and magnetism atomic physics and nuclear physics.

4: - What is a hypothesis? Give an example.

Ans:- On the basis of this data collected through observation we can develop a hypothesis. This is done in order to test its logical results i.e. it is assumed that nature will act in a particular way under certain specific circumstances.

For example: we assume the shadows of opaque objects are formed when they come in the path of light because light travels in a straight line.

5:- Distinguish between a theory and a law of Physics.

Ans:-

Theory	Law
After the successful experimentation of a assumption (hypothesis) and with the help of careful experimentation it becomes a theory and is applicable to similar phenomena.	When a theory has been tested many times and generally accepted as true it is called as law. The law is such a statement regarding the behavior of nature which explains the observation and experiments

	of the past and can predict about other aspects of nature

Constructed Response Questions

1: - Is the theory of science an ultimate truth? Describe briefly.

Ans:- No, the theory of science is not an ultimate truth. Science is a continuous process of inquiry and improvement. Scientific theories are based on current evidence and understandings
They are subject to change refinement as new evidence emerges.

2: - Do you think that the existing laws of nature may need a change in future? Describe briefly.

Ans:- The theories or laws of physics are manmade ideas about the way the things work. They are liable to be disapproved or modified with the future advances in science which brings fresh facts and new insights about the natural and physical world.

3: - Describe three jobs that need the use of scientific knowledge.

Ans:- Doctors use scientific knowledge of biology anatomy and physiology to diagnose and treat diseases.
Engineers apply principles of physics mathematics and materials science to design and construct structures machines and technologies.
Environmental scientists study ecosystems pollutions and climate change using knowledge of biology chemistry and geology.

4:- Describe when a theory is rejected or needs its modification.

Ans:- A theory is rejected or needs modification when:

(i) When a new theory provides a more accurate or comprehensive explanation of phenomena.

(ii) If the theory cannot explain certain observation or is only applicable in specific conditions.

7: - If a hypothesis is not testable, is the hypothesis wrong? Explain.

Ans:- If a hypothesis is not testable it is not scientifically valid but it is not necessarily wrong It cannot be evaluated scientifically until it is made testable.

Comprehensive Questions

1: - What are the main branches of Physics? State briefly.

Ans:- There are many types of branches of physics. Some of them are as follows.

(i) **Mechanics:** It is study of motion and the physical effects which influence motion and gravitation is often called classical mechanics.

(ii) **Acoustics:** It deals with the nature and physical aspects of audible sound energy.

(iii) **Optics:** It deals with the physical aspects of visible light.

(iv) **Nuclear Physics:** It is the study of the properties of nuclei of atoms.

3: - What is scientific method? Describe its main steps with examples.

Ans: - Scientific method is a systematic approach used to search for truth of an issue and problem solving regarding natural and physical world.
It is based on the following steps:

1. Identify or recognize an issue or a problem.
2. Gather information through observation of its various aspects.
3. Propose an explanation or guess work know as hypothesis.

4. Perform experiment or collect evidences to test the hypothesis.
5. Record, organize and analyze gathered data, plotting and interpreting graphs to reach at a conclusion which is called a theory.
6. Repeated tests of the theory to wide range of similar issues then lead towards the formulation of a law.

5: - What is the scope of Physics in everyday life? Give some examples.

Ans: - Scope of Physics: -Physics is the fundamental Science that deals with the constituents of the universe that is matter energy space time and their mutual relationships and interactions.

i. It strives to understand how the universe works from the smallest subatomic particles to the largest star and galaxies.

ii. The Time measures the sequence and duration of events. It is considered fourth dimension. For example, oscillating motion such as that of swinging pendulum relies on the time interval that determines frequency of oscillations. Another example is the time dilation which is a phenomenon discussed by special theory of relativity where time passes slowly for an observer moving with speed at ultra-high speed compared to one relativity at rest.

Additional Questions

1: - Define mechanics and acoustics.

Ans: - Mechanics: It is the study of motion and physical effects which influence motion.
Acoustics: -It deals with nature and physical aspects of audible sound energy.

2:- What is meant by electromagnetism and quantum mechanics?

Ans: - Electromagnetism: It is the study of electromagnetic phenomena and mutual relationship between electric current and magnetic field.
Quantum Mechanics: It explains the behavior of particles at atomic and subatomic level.

3:- Define Astronomy and biophysics.

Ans: - Astronomy: It is the study of distribution of celestial bodies like planets stars & galaxies.
Biophysics: Some biological system and processes are described using principles or techniques of physics.

4:- Define geophysics, climate physics.

Ans: - Geophysics: - It applies physical principles to the study of internal structure of the Earth, its magnetic and gravitational fields, seismic activity volcanoes etc.
Climate Physics: It includes the study of physical processes in the environment, including atmospheric dynamics, climate change and weather conditions.

5: - Write down the steps of scientific method.

Ans: - Steps: -1. Observation. **2.** Hypothesis **3.** Experiments **4.** Theory **5.** Predication **6.** Feasibility **7.** Law

6: - Define Science and Physics.

Ans: - Science is a collective knowledge about natural phenomena or events.
Physics is branch of science that deals with matter energy space time and their mutual relationship.